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THE AMERICAN ASSOCIATION FOR THE
ADVANCEMENT OF SCIENCE.

THE MODERN 'DROIT D'AUBAINE.'*

ONE of the dark spots in the dark and middle ages is the treatment of foreigners. Was a ship wrecked upon the French coast? What was saved was saved for the seigneur who owned the shore, or his overlord, the king. The lading and the crew were alike his, to dispose of as he would. If the sailors were uncivil enough to set up a claim to the wreckage, he could kill them. If he preferred, he could sell them as slaves. It was his right—the *droit de naufrage*.

It was on the same principle that down to modern times, if a man happened to die while traveling or living abroad, his estate, in many countries of Europe, was seized and kept by the lord of the manor or the sovereign of the land. His will was disregarded. His natural heirs, unless born on the soil or naturalized citizens, were set aside. All that he left belonged to the governing power.

Quite naturally, as trade between nations became more considerable, the countries which retained this *droit d'aubaine* in its full vigor and severity found few merchants ready to bring cargoes to their ports. The result was successive modifications of the system. Certain trading centers were exempted from its operation. Naturalization was to be easily had by traders, and when obtained relieved them from subjec-

* Address of the vice-president and chairman of Section I., American Association for the Advancement of Science, at Philadelphia.

tion to it. Government securities held by any foreigners passed to their natural successors or by will.*

The interest of the government called for such relaxations of its so-called right, and the king who relaxed it most, because he saw most clearly that it was for his advantage so to do, found the foreign trade of his dominions grow most rapidly and settle itself upon the most stable footing.

The *droit de naufrage* was the first to disappear. The humaner law of the Christian emperors of Rome,† followed by the Visigoths in Spain in the seventh century,‡ and enforced in the twelfth by the laws of Oleron, appealed successfully to the awakening conscience of the modern world.

Anything in the nature of a *droit d'aubaine* had also been denounced in the *Corpus Juris* of Roman law.|| As time went on, its range became more and more contracted, and by the close of the middle ages it had become, so far as personal property was concerned, generally softened in practise to what was called a *jus detractus*,¶ except in case of those dying intestate and without known heirs.

As respects real estate in one country owned by citizens of another the sovereign of the former might still claim it as his own; but it was because political considerations were deemed to require it. In a nation whose constitution of government or family institutions rest on a landed electorate or aristocracy, it is right to debar foreigners from holding what might

enable them to influence directly the conduct of government. This is the defence of the system of escheats under the common law of England, abolished there in 1870,* but which still lingers on in many of the United States.

It took the flames of revolution to burn the *droit d'aubaine* out of the institutions of France, and for a time, under Napoleon, it was restored as respects citizens of any nation which yet might retain it.†

Under the *jus detractus*, the sovereign within whose dominions a foreigner chanced to die no longer claimed title to all his goods, unless no will and no next of kin were anywhere to be found.‡ He was content with part, and, after making this 'detraction,' or, as we should say, 'subtraction,' gave up the rest to the natural heirs, or those to whom it might have been bequeathed by will.

So if a subject of his own should die, leaving a will in favor of foreigners, or having only foreign heirs, they were admitted to the succession, subject to a detraction of the same kind.

The percentages retained, in either case, as time went on, became more and more moderate. Reciprocal conventions between different nations for their regulation in this respect were not uncommon. Five

* With a proviso that an alien acquiring land should gain no political rights thereby.

† Civil Code, Arts. 726, 912; Law of July 14, 1819.

‡ If there be no better claim, that of the sovereign within whose territory property left by the dead is found is clearly good. The leading powers of continental Europe at their Conference held at the Hague in 1904, agreed (subject to the principle of reciprocity) to the mutual recognition of this right and the denial of any other in the nature of escheat or *aubaine*. 'Projet d'un Convention sur les conflits de lois en matière de succession et de testaments,' Art. II., *Revue de Droit International Privé*, VI., 348. Sixteen European powers and also Japan agreed to and signed this project, June 7, 1904.

* Merlin, 'Répertoire de Jurisprudence,' *Aubaine*, No. VII.

† Code, XI., iii., 5, *de naufragiis*, 1. Cf. Digest, XLIX., xv., *de captivis et de postliminio*, 5, 2.

‡ V., 5, *Corpus Juris Germanici*, 2001.

§ Art. 25, 26. 1 Peters' Admiralty Decisions, xli., note.

|| Code, VI., lix., *Communia de Successionibus*, 10.

¶ Fiore, *Droit International Privé*, I., Preliminaries, ch. II.

per cent., which was the duty imposed in the first inheritance tax law of Rome—the *vicesima hereditatum et legatorum* decreed by Augustus—became not an unusual rate to fix by such an agreement in the latter half of the eighteenth century.*

So far as concerns such a tax on foreigners who come to take away what forms part of the wealth of a nation, it is, if the rate be moderate, in no sense inequitable. But for one sovereign to tax what belongs to the wealth of another bears a different aspect. It is the *droit d'aubaine* in a new dress and a politer form. It even asserts itself over a larger field.

The ancient *droit d'aubaine* was exerted almost exclusively in the case of foreigners dying within the realm; never except over tangible property found within it, belonging to their estates. The modern *droit d'aubaine* fastens upon all their property so found, whether tangible or intangible, and this whether they died within the realm or in their own country, out of which, perhaps, they had never set foot.

In the first of the treaties of the United States with foreign powers their right to do even this, with respect to estate left within their jurisdiction by an American citizen, was excluded, provided a reciprocal exemption were assured in return. This was that negotiated with France in 1778 (and abrogated by Congress in 1798), Art. XI. of which read thus:

The subjects and inhabitants of the said United States, or any one of them, shall not be reputed aubains in France, and consequently shall be exempted from the *droit d'aubaine*, or other similar duty, under what name soever. They may by testament, donation, or otherwise, dispose of their goods, moveable and immovable, in favour of such persons as to them shall seem good, and their heirs, subjects of the said United States, residing whether in France or elsewhere, may succeed them ab intestat, without being obliged to obtain letters of naturalization, and without having the effect

* See Merlin, 'Répertoire de Jurisprudence,' Détraction.

of this concession contested or impeded under pretext of any rights or prerogative of provinces, cities, or private persons; and the said heirs, whether such by particular title, or ab intestat shall be exempt from all duty called *droit de détraction* or other duty of the same kind, saving nevertheless the local rights or duties as much and as long as similar ones are not established by the United States, or any of them. The subjects of the Most Christian King shall enjoy on their part, in all the dominions of the said States, an entire and perfect reciprocity relative to the stipulations contained in the present article but it is at the same time agreed that its contents shall not affect the laws made, or that may be made hereafter in France against emigrations, which shall remain in all their force and vigour, and the United States on their part, or any of them, shall be at liberty to enact such laws relative to that matter as to them shall seem proper.*

Among our later treaties with like or broader provisions may be mentioned those with Sweden of 1783, with Würtemberg of 1844, with Saxony of 1845,† with France of 1853, with Germany of 1876 and with Great Britain of 1900. The exemptions secured by those of the older type related only to property left in or subject to the control of one country by citizens of the other, at the time of their decease. They did not extend to interests of citizens of one in succession to estates of citizens of the other, which are in course of administration in the courts of the latter.‡ The later conventions do extend to these.§

The provision in the Constitution of the United States, securing to citizens of one state the ordinary privileges common to citizens of any other into which they may go, gives to our people a somewhat similar measure of security. But it has not prevented the building up, slowly at first, rapidly of late, of a network of state tax-

* 2 U. S. Rev. Stat., 206.

† *Ibid.*, 723, 809, 690.

‡ *Frederickson v. Louisiana*, 23 Howard's Reports, 445.

§ *Geofroy v. Riggs*, 133 United States Reports, 258.

laws, imposing succession duties on property left within the state by deceased citizens of other states, without regard to whether their representatives have already paid similar duties at home, and so are subjected to a double burden for a single privilege.

Within limits no economist will question the propriety of laying taxes on bequests and inheritances. They are collected with ease and reasonable certainty. They fall upon something which the taxpayer has never yet enjoyed and the diminution of which he therefore does not fully miss. The goose, to follow Colbert's maxim, is plucked so as to get the most feathers with the least squealing, and almost with none. Live goose feathers, indeed, are not required. The real victim is dead.

As to whether the form to be preferred is that of a probate duty, a stamp duty, a tax on the privilege of transmission, or a tax on the privilege of receiving what is transmitted, opinions may fairly differ.

Death duties were first imposed in Great Britain towards the close of the eighteenth century. Under the system developed there the movable property, wherever situated, of a person dying domiciled in the kingdom is subject to them, but not such property left in the kingdom by one who died domiciled in any other country.*

What is taxed is not the interest in property to which some person succeeds because of the death of its former owner, and not property at all, but the interest in property which the former owner lost upon his death and which would have ceased to exist altogether had not the state seen fit to prolong it in favor of those whom it recognizes as entitled to the succession.

It is this prolongation or revival of an

* *Cross v. United States Trust Co.*, 131 N. Y. 643. As to probate duties, the statutes make a different provision. *Fernandes' Executors' Case*, 5 Chancery Appeals, 314.

estate which death has destroyed—a prolongation by force of no natural law, but only of the will of the political sovereign, that justifies a succession tax.*

The earliest American succession duties were levied by Congress in 1797, and took the form of a stamp tax on receipts for legacies.

Pennsylvania was the first state to impose them. She did this in 1826, but the law did not extend to goods of those not inhabitants of the state, which had been temporarily left there.† They were left untouched, in deference to the ancient maxim of private international law, *mobilia personam sequuntur*.

It was this maxim that had always been the chief measure of the jurisdiction of courts over the settlement of the estates of the dead. The estate had been treated as a kind of a survival of the person who once held and administered it. It therefore had its principal seat in the place which had been his home. Transfers of goods *inter vivos*, founded on contract, may be regulated by the law of the place of transfer; but transfers of the whole of a man's goods, upon his death, by force or permission of law, must, in fairness to all concerned, be regulated by the law to which he was subject. In England and America it is settled that this is the law of his domicile.

Those to whom that law gives them acquire a good title the world over. There is but one succession to a dead man's goods, and that takes place once for all when he dies and where he dwelt.‡ This law, which protected him while they were his, and

* *Oreutt's Appeal*, 97 Pa. State Reports, 179.

† *Knowlton v. Moore*, 178 U. S. Reports, 41, 49, 55.

‡ *Wharton's Private International Law*, §§ 80, a, Reports, 330; 30 *Northeastern Reporter*, 125; *Frothingham v. Shaw*, 175 Mass. Reports, 59; 55 *Northeastern Reporter*, 623.

directs the course of their devolution when he is no more, may justly tax those who benefit by their devolution, irrespective of the place of their residence, or of that where the goods may chance to be found.

Our American succession taxes, like those of England, are everywhere, when imposed by the state where the deceased had his home, measured by a percentage of the value of all his goods, wherever situated, and all his real estate situated within the state, subject to some exemption of moderate amount.

But during the last twenty or thirty years the states have begun to go farther and charge a like percentage on all goods of a non-resident, which may be subject to their power.

There is no legal objection to this.

It is not double taxation within the meaning of any constitutional prohibition. In law, double taxation occurs only when the same sovereign taxes the same thing twice. But aside from this, a law of the kind now in question does not tax the same thing which had been taxed before. The sovereign of the domicile only can tax the succession to goods, because the succession takes place, once for all, under his laws and in his territory. What the sovereign of the *situs* of goods left by a foreign decedent taxes is not the succession to them, and not the goods themselves, but the privilege of taking them away, under the title derived from that succession.* The title is unquestionable, and unquestioned, but the right of the owner to avail himself of it in foreign territory depends on the comity of the foreign sovereign, who if he permits a transfer can prescribe the terms.†

* Foelix, *Droit International Privé*, I., § 9.

† *Magoun v. Illinois Trust and Savings Bank*, 170 U. S. Reports, 283, 288; *Dammert v. Osborn*, 141 N. Y. Reports, 564; 35 *Northeastern Reporter*, 407.

Nor is a tax so imposed any infringement of the privileges and immunities of citizens of other states, for they are treated precisely as those of the state by authority of which the tax is laid.

It is an infringement of a maxim of private international law; but such maxims may be set aside by any political sovereign who thinks it for his interest to disregard them. Our courts, in the absence of legislation to the contrary, treat the doctrines of private international law as part of the common or unwritten law, but it is only in the absence of legislation to the contrary. A statute can always abrogate unwritten law.

Not only is it lawful, but in many cases it seems not unjust, for a sovereign to tax the succession on goods within his dominions, left by a foreigner. If they were not simply in transit, but had been there so long as to become part of the wealth of the realm and to share in the settled protection of the government, they were subject to taxation for it when the owner was alive; and as the new successors must come there for possession, and can only dispossess those in whose hands they may be left by force of this sovereign's laws, and if need be, by process from his courts, they can not seriously complain if he asserts a right to tax them for what they get.

So it is also in the case of intangible property when that has been long placed by the owner in the hands of agents in a foreign country to manage and invest.*

But while such successions can be taxed by a sovereign of the domicile and taxed again by the sovereign of the *situs*, it is quite another question whether they should be.

* *New Orleans v. Stempel*, 175 U. S. Reports, 309; *In re Lewis' Estate*, 203 Pa. State Reports, 211; 52 *Atlantic Reporter*, 205; *In re Romaine*, 127 N. Y. Reports, 88; 27 *Northeastern Reporter*, 759; 12 *Lawyers' Reports Annotated*, 401.

Had we adhered inflexibly to the universal maxim of ancient law—*mobilia personam sequuntur*—the results would unquestionably have been far better. Every state laying a succession tax lays as high a one as it deems best to impose. It selects a certain subject for taxation and presumably exacts all that it can fairly be made to yield. For another state to tax the same subject again, therefore, is to impose a heavier burden than it ought to bear.

If the state in which the decedent's estate is settled collects the only duty, and this were the universal rule, nothing in the long run could be lost by any other state. On the average one would profit as much as another by uniformity of rule. While every state would let the citizens of another withdraw the property of the dead untaxed from its territory, its own citizens, as heirs or legatees, would bring back with equal freedom property of the same kind from all the rest.

As a matter of fact and history our legislatures in this matter have claimed the benefit of the rule *mobilia personam sequuntur* whenever it served their purpose to invoke it, and set it aside whenever it served their purpose to disregard it.

The test of taxability, as respects a succession to intangible property of a non-resident, may be said to be this: Whatever may be its form, if it have a money value and, although it may be fully owned by and fully transferable by the successor, can not be enforced or converted into money contrary to the will of the person against whom the right of property exists, without coming into the state imposing the tax, then it is property within that state and taxable as such.*

* *In re Whiting's Estate*, 150 N. Y. Reports, 27; 44 Northeastern Reporter, 715; 34 Lawyers' Reports Annotated, 322; 55 Am. States Reports,

If a citizen of Texas die, having money on deposit in a New York bank, a succession tax may be levied on it by New York as well as by Texas.* If he leave bonds in his box in the vaults of a New York Safe Deposit company, and they are due from a citizen or corporation of New York, both states can exact the same percentage on these. If the bonds are those of a person or corporation of a third state, they may be subject to three taxes. The state where he lived lays a succession tax on their full value because he was subject to its power. The state in which the bonds are deposited for safe-keeping lays a tax of the same, or perhaps greater amount, on their full value, because the bonds are in its hands, and it will not let them go without receiving it. The state where the debtor who signed the bonds belongs can also levy as large a tax, because it can refuse any remedy in its courts for their collection except on such terms as it may itself lay down. So in the case of corporation stocks, the shareholder's estate pays one succession tax to the state of which he was a citizen, and those who succeed to him pay another to the state chartering the corporation, and possibly a third to a state in which the stock certificates were kept;† for by holding on to them till such tax were paid it could put a serious obstacle in the way of their sale and transfer.

It is to be remembered also that there is no constitutional limit to the rate of taxation. In Holland in the eighteenth century, collateral successions falling to the remoter kindred were subject to a deduction

640; *In re Houdayer's Estate*, 150 N. Y. Reports, 37; 44 Northeastern Reporter, 718; 34 Lawyers' Reports Annotated, 235; 55 Am. State Reports, 642; *Buck v. Beach* Indiana Reports, 71 Northeastern Reporter, 962.

* *Blackstone v. Miller*, 188 U. S. Reports, 189.

† *In re Bronson*, 150 N. Y. Reports, 1; 44 Northeastern Reporter, 707.

in favor of the state of thirty per cent.* Three such taxes would leave of the oyster little but the shell.

In 1898, during the war with Spain, Congress also levied an inheritance tax, and the burden or the succession was heavier still until the repeal of that measure a few years afterwards. It did not, however, apply to personal property here passing on the death of the owner to citizens of another country.†

The results of this condition of multiple taxation are rapidly becoming apparent.

Capitalists are beginning to center their investments at home. They prefer to put their money in domestic stocks and securities, for these, upon their death, will be taxable but once. They are inquiring in which states, out of their own, it is safest to make or maintain investments; that is, in which states there are either no inheritance-tax laws or no inequitable ones. They are organizing corporations, which never die, to hold their property. They are taking title jointly with their wives or children, so that death leaves the survivor the sole owner.

It has been said that a country should never tax anything of value which, if not taxed, would be likely to find its way there, and which, if taxed, would be able to escape from its power.‡

The American people are quick-witted. It will not take long for all of them to learn in which of the states they can and in which they can not do business without subjecting their property, in case of death, to what is practically double taxation.

Wall Street is to-day the financial center of a great stretch of American territory.

* Adam Smith, *Wealth of Nations*, III., Book V., 326.

† *Eidman v. Martinez*, 184 U. S. Reports, 578.

‡ See David A. Wells on Taxation, 'Cyclop. of Political Science,' *ad fin.*

The trust companies, the banks and the safety deposit vaults of New York City hold vast amounts of moneys, bonds and commercial paper belonging to residents of other states, who have left them there for security, or to use them for investment or reinvestment. Their owners are taxable on them where they live. Their estates are taxable on them there, if they die. Let those men once fully understand that their estates would be also taxable on them in New York, and it will not be long before their investments take a new shape or are put under different keeping.

An inheritance tax by a state upon what is left by its own inhabitants is right and just. It is right and just to place it upon real estate situated within its territory and belonging to an estate of a dead man. It may be not unfair and not impolitic to place it upon tangible personal property of such an estate which has been statedly kept within its territory, and on which no such tax is imposed in the state or country to which its former owner belonged. But to tax it twice; to wring from widow or children or creditors, who have already paid one inheritance tax to the state under whose laws the estate is in course of settlement, another of a like kind, if not unfair, is certainly impolitic. It contravenes the settled conceptions of private international law—conceptions that, through long ages of unbroken tradition, have worked their way into the popular mind and become identified with those of social justice and economic law.

"Ein tiefer Sinn wohnt in den alten Bräuchen.
Mann muss sie ehren."

According to these, the succession to a dead man's goods is to be determined by the law either of the country of which he was a citizen or of that—generally the same—in which he had his home; and through that law it is to be worked out to the last detail.

As death comes but once to every man and is the one event on the happening of which the devolution of his estate takes place, so that devolution, to work justice, must, as far at least as his personal property may be concerned, follow one single course of law.

During the last few years the principal nations of continental Europe have held four successive conferences at The Hague, to regulate the rights of the citizens of each with respect to acts and transactions that may come under consideration in the courts of the rest. On several points they have reached a definite agreement, in the shape of reciprocal conventions, ratified by the leading powers. A new convention was proposed by the last conference, held in June, 1904, on the subject of succession to the dead. It secures its regulation according to the law of the country of which the former owner was a citizen or subject.

England and the United States have thus far adhered to the view that the law of the land in which he had his home should govern. But under either rule the same end is secured—unity of administration. A single succession is to be regulated by a single law.

Our new American practice must operate as a divisive force within the American Union.

It attacks the prosperity of the country at a vital point. The United States have grown great and rich because of the principle of absolute free trade between the states so far as anything in the nature of a tariff is concerned, and absolute free trade in all respects, except so far as Congress may see fit to legislate to the contrary. It was the change to this policy from that of the pre-constitutional era that made the United States a living nationality. Under the Articles of Confederation each of the thirteen equal sovereigns could tax and often did tax the

products of the others. In May, 1784,* for instance, Connecticut laid a duty on all goods imported from any other state, except such as had been previously imported from abroad by a citizen of Connecticut for use or sale in Connecticut. This law was expressly made applicable even to the baggage of passengers arriving by water. To such legislation the Constitution of the United States opposed an effective bar, and in so doing benefited every state to the injury of none.

A recent statement from the Bureau of Statistics at Washington shows that the total value of the goods dealt in last year throughout the United States in their internal trade, based on what they cost the first consumer, was twenty-two billion dollars. This is nearly fifteen times as great as that of the goods which we export; nearly twice that of all the goods imported during the same year in international trade throughout the world, and more than twice that of the whole world's exports for the same period. Much of this home trade is purely domestic; but much also is trade between the states.

Anything which impedes the free transmission of money or moneyed securities from one state to another so far unstrings the sinews of this commerce between the states. To tax their transmission when they pass in a mass, by the event of the owner's death, is to create an impediment to their transmission by him during his life which the public are fast learning to regard as very serious.

This evil first arose during the closing years of the nineteenth century. How shall it be remedied in the twentieth?

Could Congress treat it as so far affecting commerce between the states (and with foreign nations, for the double burden falls often on foreign heirs and legatees) as to justify a statute of the United States pro-

* Statutes, Ed. 1784, 271.

viding that such a tax, as regards any one estate or any one item of property belonging to an estate, could be laid but once?

If so, it would be to advance the powers of the nation a step farther than they have ever yet gone, and weaken correspondingly the sovereignty of the states. If, on the other hand, Congress has no such power, does it not naturally lead to the conclusion that the states have? Certainly a remedy more in accordance with our constitutional traditions than an act of Congress would be concerted action to the same end by the states under the principle of reciprocity.

From the beginnings of American history, neighboring English colonies were accustomed, at times, to send delegates to mutual conferences on matters of common interest. When they became states, the same practise was continued. Agreements were made in such conventions while the Articles of Confederation were in force, affecting matters of importance, although some of the statesmen of the day viewed them with disfavor as contrary to the spirit of the confederated government and tending to disintegrate the Union.*

This led to the provision in the Constitution of the United States (Art. I., Sec. 10) that no state should 'enter into any Treaty Alliance or Confederation' nor * * * 'without the consent of Congress * * * enter into any Agreement or Compact with another state or with a foreign power.'

The courts have construed these provisions so as to make them detract as little as may be from the sovereignty of the states.

Three principles may be considered as settled with regard to them:

1. They do not refer to any agreements not affecting the political relations of a state to another state or to the United

* 'Madison's Introduction to his Journal of the Federal Convention' (Scott's ed.), 47.

States.* It was their object to prevent the formation of any combination of states that might encroach upon the supremacy of the United States.†

2. No agreement or compact between states is to be deemed of that nature, unless it is clearly such.‡

3. Agreements or compacts between states of a political nature, although made without asking or obtaining the consent of Congress are not invalid if Congress afterwards should ratify them.§

In practise the states from the first have regarded this section of the constitution as not precluding arrangements and agreements between any of them of a business character which they might deem of mutual advantage.

They have by concurrent grants of charters similar in form created interstate corporations, which are as much at home in one state as another, and have in each the same powers and rights under the same name and with the same members.||

Interstate commissions have been constituted by appointments made by neighboring states to ascertain and mark the boundary between them.¶

Statutes to promote freedom of intercourse and exchange of business between states, have been passed by one state in favor of non-residents, conditioned on the existence of like legislation in the state of which they may be citizens.

* *Virginia v. Tennessee*, 148 U. S. Reports, 503, 519.

† *Williams v. Bruffy*, 96 U. S. Reports, 176.

‡ *Baltimore and Ohio R. R. Co. v. Harris*, 12 Wallace's Reports, 65, 82.

§ *Green v. Biddle*, 8 Wheaton's Reports, 1. Cf. 21 U. S. Statutes at Large, 351; *Wharton v. Wise*, 153 U. S. Reports, 155.

|| *Two Centuries' Growth of American Law*, 279; *Graham v. Boston, Hartford and Erie R. R. Co.*, 118 U. S. Reports, 169, 170; 'Report of the American Historical Association for 1902,' I., 268.

¶ 'Papers of the New Haven Colony Historical Society,' III., 284, 286.

Since the introduction of automobiles statutes have been passed in some states requiring them to be registered and numbered, and the number, with the first letter of the name of the state, to be displayed on the vehicle, but with a provision that this shall not apply to automobiles coming into the state from another in which they have been registered and numbered under a similar law, and which make a similar display of the letter and number required there.*

Foreign insurance companies are often prohibited by statute from entering a state to do business, unless they fulfill certain prerequisites, with an exception in favor of those coming from a state or country where no such conditions are exacted from companies of the state enacting such statute.† So they are often subjected to certain taxes or fees, if and only so long as such taxes or fees are required by the state of their charter from companies created by the state by which the statute is passed.‡

Reciprocity with reference to foreign countries is also a feature of some of our state statutes for the removal of the common law disability to hold real estate. It is removed as respects citizens of countries imposing no such disability on American citizens who may seek to acquire lands within their jurisdiction.§

Statutes have been passed by one state to promote the administration of justice in certain others, or in all others, on conditions of reciprocal legislation on their part.

Thus in the first half of the nineteenth

* 'Public Acts of Connecticut,' 1903, 73.

† See 'General Statutes of Connecticut,' §§ 3,508, 3,544, 3,652.

‡ 'Public Statutes of Rhode Island,' Rev. of 1882, p. 396, Sec. 396; 'New York Revised Statutes,' 9th ed., II., 1146.

§ See 'Texas Civil Statutes,' I., Art. 9 (a statute passed in 1854).

century New Hampshire enacted a statute to the effect that if one of her inhabitants were wanted in any other state as a witness for the prosecution in a case of felony, a subpoena requiring him to repair thither to testify at the trial might issue from a New Hampshire court on the request of the judicial authorities of the other state. Proper compensation for the expenses of the journey was to be tendered, and if, after such tender to the person whose presence was desired, he failed to appear at the trial, he was to be liable to a forfeiture of \$300. Maine then adopted a similar statute except that it applied only to prosecutions pending in a New England state. Massachusetts followed in the same line, except that she confined the remedy to neighboring states, and to Maine, and in 1902 New York did the same with respect to bordering states, but on condition of the enactment on their part of reciprocal legislation of similar effect. Connecticut and Pennsylvania have since passed laws on this subject of the same general purport.*

In some similar way the states of the United States may yet come to a mutual understanding, and reciprocal justice become the rule in dealing with successions, whether by will or by inheritance.

A suggestion to that end was made in 1901 by the Buffalo Conference on Taxation. This body, composed of representatives of about thirty states, appointed by their respective governors, unanimously adopted this resolution:

WHEREAS, modern industry has overstepped the bounds of any one State, and commercial interests are no longer confined to merely local interests; and whereas, the problem of just taxation can not be solved without considering the mutual relations of contiguous states; be it

* 'Public Statutes of New Hampshire,' ed. 1842, p. 382; of Maine, ed. 1871, p. 876; of Mass., ed. 1882, p. 986. 'Public Acts of Connecticut,' 1903, 57; 'General Laws of N. Y.,' 1902, p. 328.

Resolved, That this conference recommend to the states the recognition and enforcement of the principles of interstate comity in taxation. These principles require that the same property should not be taxed at the same time by two state jurisdictions, and to this end that if the title deeds or other paper evidences of the ownership of property, or of an interest in property are taxed, they shall be taxed at the *situs* of the property, and not elsewhere. These principles should also be applied to any tax upon the transfer of property in expectation of death, or by will, or under the laws regulating the distribution of property in case of intestacy.*

The Massachusetts Tax Commission in 1897 reported a bill to carry out the same principle, though on somewhat different lines.†

Machinery to facilitate a concert of action for the accomplishment of some such result, has for some years been in existence and active operation. This is the annual Conference of Commissioners of States on Uniform Legislation, held in connection with the meetings of the American Bar Association, and now representing a large majority of all the states. Its office is to frame and recommend to the states for adoption bills for suitable laws on subjects of common concern which ought to be regulated everywhere in the same way. The result of its labors may be seen in the existence of identical laws in the statute books of a number of states, which have been adopted on its initiative, the most conspicuous instance being that of the Negotiable Instruments Act.

It may well be doubted whether the form of reciprocity recommended by the Buffalo Conference is the best. It is not that naturally suggested by the Anglo-American rules of private international law. These would favor adhesion to the law of the state where the succession occurred—that of the last domicile of the deceased owner. On the other hand, the plan so

proposed might be more answerable to the demands of modern society. It would serve to pay for protection to property actually received, in contradistinction from protection theoretically imputed.

But the only question to which the limits of an address like this permit me to call your attention is the larger one of the possibility and expediency of any reciprocal arrangements looking in this direction.

Could they or could they not be regarded as varying the public relations of the states concerned? Would or would not each stand towards the other in the attitude of a favored nation, since its citizens would be freed from a burden remaining upon those of other states? Is or is not a statutory grant of an exemption from taxation in favor of those belonging to another sovereignty, conditioned on the concession of a similar privilege by the latter to the citizens of the state enacting the first statute, and followed by such a concession, in substance a political compact between the enacting powers?

If there be any such constitutional bar, it could be easily removed.

The arrangement could hardly be deemed to stand on the footing of a treaty, alliance, or confederation. If not that, the consent of Congress would avoid any possible objection. There is no reason to doubt that this would be gladly given. Congress could hardly fail to welcome any proposition from states, looking towards concurrent legislation of the description named. Not only would it remove what is not unlikely to prove a serious impediment to free commercial intercourse between the states, but it would remove it in the interest of fair dealing and equal rights.

It may be suggested that even with the authority of Congress no such exclusive reciprocity could be established between two states by reason of the further constitutional provision (Art. IV., Sec. 2) that

* 'Judson on Taxation,' p. 547 note.

† 'Report of the Commission,' p. 191.

the citizens of each state shall enjoy the privileges and immunities of citizens in the several states.

The purpose of this section, however, is to prevent discrimination by one state against the citizens of another. Can it be said that a statute makes such a discrimination if it leave them entitled to the same privileges and immunities as those possessed by the citizens of the state making the enactment? The citizens of that state being required to pay a succession tax, can the citizens of another state, coming there to receive an inheritance or bequest, complain if they are subjected to the same burden, even if those of a third state may not be? Is not the discrimination which the constitution prohibits one in favor of residents against non-residents, rather than one between non-residents who are citizens of different states?

The supreme court of the United States in 1831 had before it a cause which showed the complications as to state sovereignty over dead men's estates existing even under the established principles of private international law. A citizen of Virginia died in Pennsylvania, leaving personal property in the District of Columbia. A local administrator was appointed in Washington, and the question was whether the local law there or the law of Virginia should govern the distribution of the Washington assets. The court held that as the District of Columbia had the fund in its power, its law must control its disposition. "Whether," it added in its opinion, "it would or would not be politic to establish a different rule by a convention of the states, under constitutional sanction, is not a question for our consideration. But such an arrangement could only be carried into effect by a reciprocal relinquishment

of the right of granting administration to the country of the domicile of the deceased exclusively, and the mutual concession of the right to the administrator so constituted to prosecute suits everywhere in virtue of the power so locally granted him; both of which concessions would most materially interfere with the exercise of sovereign right, as at present generally asserted and exercised."*

The convention here suggested, no doubt, was one to be called by Congress, under Article V. of the constitution of the United States, to propose amendments to it. There had then been but one instance of the convocation of any other kind of convention of representatives of states since 1789. That was the Hartford Convention of 1814, of delegates from three states, and it had been generally and unsparingly denounced as an unconstitutional assemblage for illegal purposes.†

Since that time, however, another of a more imposing character, and equally political in its objects, has been held at Washington—the peace convention of 1861—in which twenty-one states participated, and which was officially recognized by the president of the United States. The public were satisfied that this body accomplished a useful work in bridging over the passage of power from one party to another at a time when every day of continued peace was of the highest national importance, and although its right to act or indeed to exist was vigorously denied upon the floor by some of its own members,‡ the verdict of history must be in its favor.

Since then, besides many conferences or conventions from time to time of representatives of states under executive appoint-

* *Smith, Adm'r v. Union Bank of Georgetown*, 5 Peters' Reports, 518, 526.

† Adams, 'New England Federalism,' 245, 256.

‡ 'Debates and Proceedings of the Peace Convention of 1861,' 129, 134, 415.

* *Paul v. Virginia*, 8 Wallace's Reports 168, 180; *Blake v. McClung*, 172 U. S. Reports, 239, 248, 257.

ment, the National Conference of Commissioners on Uniform Legislation, to which reference has been made, has become a standing institution of unquestioned authority. That authority, indeed, is only to deliberate and to recommend. It makes no agreements between states. But it does initiate action by the states, through which, on some points, they are brought by the legislative action of each into a position of agreement.

Should it be able to agree on the recommendation of a definite, equal and consistent policy as to the subject which has been under our consideration, expressed in the form of an identical statute for general adoption in each of the states which it represents, it is not impossible that, one after another, the states would fall into line and follow the plan proposed.*

The tendencies of the time make for such a movement. Individualism and state-isolation are each giving way at every point of material contact to collectivism. The time-spirit and the world-politics of the twentieth century alike point to reciprocal governmental action on a great scale, for the prevention of international or interstate complications and collisions, as the true basis of national prosperity.

SIMEON E. BALDWIN.

*PROCEEDINGS OF THE AMERICAN SOCIETY
OF ZOOLOGISTS. SECOND ANNUAL
MEETING OF THE EASTERN
BRANCH.*

THE second annual meeting of the Eastern Branch of the American Society of

*One state has already made a move in this direction. Connecticut prior to 1903 had not taxed goods of non-resident decedents by means of a succession duty. In 1903 she laid such a tax on them, but with a waiver of its enforcement in case of a succession to decedents belonging to a state or country not exacting such a duty upon personal property left within its jurisdiction by Connecticut decedents. Public Acts of Conn. for 1903, 43, Sec. 2. Gallup's Appeal, 76 Conn. Reports, 627; 57 Atlantic Reporter, 699.

Zoologists and the fifteenth annual meeting of the society since its establishment as the American Morphological Society, was held in the laboratory of physiology and pathology, University of Pennsylvania, Philadelphia, Pa., on December 27, 28 and 29, 1904.

The committee on the invitation to the International Zoological Congress to meet in this country reported that a formal invitation signed by all the members of the joint committee was personally presented at the recent meeting of the congress in Berne by Dr. Charles S. Minot and Dr. Ch. Wardell Stiles, members of the committee. The congress voted unanimously to accept the invitation and to hold its next meeting in Boston during the month of August, 1907. The congress further elected Mr. Alexander Agassiz president of the congress for the Boston meeting, and agreed to intrust the general arrangements for the meeting to the representatives of the American Society of Zoologists. It was voted that the appointment of a committee to make the necessary arrangements be left with the executive committee of the Eastern Branch acting with the executive committee of the Central Branch of the society.

The committee on zoological requirements for admission to college presented its report, which was approved. This report was published in SCIENCE, N. S., Vol. XX., December 16, 1904, pages 850-853.

It was voted that the matter of the publication of proceedings and abstracts be referred to a committee composed of the retiring secretary and the newly elected president and secretary. The officers elected for the ensuing year and those with unexpired terms are as follows:

President—William E. Castle.

Vice-President—William Patten.

Secretary and Treasurer—Henry S. Pratt.

Additional Members of the Executive Committee—Hermon C. Bumpus, Herbert S. Jennings and Ethan A. Andrews.

The following are abstracts of papers presented at the meeting:

Correlation and Variation in the Honey Bee: EVERETT F. PHILLIPS, University of Pennsylvania.

This work is a continuation of the work done by the writer with Dr. D. B. Casteel.* The usual statistical methods have been used and the material used was uniformly Italian stock, each lot numbering 500. Workers, drones from drone cells and drones from worker cells were examined and characters of the wings were measured, the veins m and m_2 and the hooks on the hind wing. In every character examined the drones showed the greater variability, although they come from parthenogenetic eggs, while the workers come from fertilized eggs. The abnormalities of venation are also more numerous in drones.

In preparation for this work two queens (sisters) were introduced to colonies of bees, one of which had no drone comb, while the other had. In both cases drones were produced in abundance. In the hive having only worker cells the drones showed a reduction of 9.13 per cent. in the mean of the character compared, showing that the size of the bee is influenced very greatly by the cell in which it grows. Since just such cases appear in nature, the variation is influenced greatly by environment. The same difference in the size of the cell occurs in the development of female eggs into workers or queens, but here a difference in the food also enters into the consideration.

Several correlations were computed and there is a high degree of symmetry of the two sides of the body but a very low correlation between fore and hind wings. The veins m and m_2 which join each other show no correlation.

* 'Comparative Variability of Drones and Workers of the Honey Bee,' *Biol. Bull.*, December, 1903, pp. 18-37.

The full tables and computed results of this work will be published elsewhere in the near future.

Correlation in Development: O. C. GLASER, Johns Hopkins University.

In the development of *Fasciolaria* a process of cannibalism takes place during which six or eight embryos swallow their less fortunate comrades, and all the unfertilized eggs in each capsule. A fully gorged cannibal may contain over 300 eggs. Correlated with this habit, which taxes to the utmost the assimilative and excretory powers, are the external kidneys. In addition to their activity as renal organs, they present two other correlations with cannibalism. In *Fulgur* they originate simultaneously with and behind the velum; in *Crepidula* they originate after the velum and behind it; but in *Fasciolaria*, probably because of the need for them, they originate before the velum appears. This earlier origin conditions a change in ultimate position, for being just below the place where the velum originates, this on growing latterly carries the excretory organs with it. Finally they hang down from its under surface. Thus cannibalism has affected the origin of these organs and the structure of the veliger.

Accessory excretory organs, and amitosis in the endoderm of the veliger are also correlated with cannibalism.

Why are so many eggs infertile? This seems to be due to ovogenetic processes. These may possibly be analogous to those occurring in the spermatogenesis of *Paludina*, for as *Fasciolaria* has 'oligopyrene' and 'eupyrene' spermatocytes which yield corresponding spermatozoa, it may also have 'oligopyrene' and 'eupyrene' ovocytes which would mature into corresponding eggs. If this prove true a far-reaching correlation exists between maturation and the whole life history.

Whether this particular correlation exist or not, *Fasciolaria* illustrates how remote processes may affect the life of an organism, and how habits, apparently so useless as the manufacture of infertile eggs and imperfect spermatozoa, may be perpetuated, since such habits may have indirect results which, like cannibalism, are useful to the species.

The 'Great Forceps' of the Lobster:

FRANCIS H. HERRICK, Western Reserve University.

In the higher orders of crustacea the chief weapons of both attack and defense, as well as for rending the prey, are the pincers or 'forceps,' borne on the first pair of massive periopods. In both American and European species two types of claw are developed, irrespective of sex, on either the right or left sides, the more primitive *toothed* or *lock-forceps*, and the larger, secondarily modified *crushing claw*.

In a fuller paper I shall be able to offer for the first time a complete history of the curious periodic sequence (first noticed by Starr in 1898), which occurs in the spines of the toothed claw, and which is apparently unique among animals—as well as of the development of the two types of claw, their structure, physiology and the changes which ensue in molting.

In the more slender lock-forceps the teeth are arranged in a linear series, in periods of eight. About midway in the serrated margin of the 'hand' or larger joint is a stout displaced spine of the first order, which forms the 'lock' to the claw. Upon closing, the dactyle falls on this spur, and its teeth slide under those of the propodus. It is thus firmly locked in this position, so that no lateral motion is possible. To meet this adjustment the tips of the claw are bent so that the dactyle is overlapped; the spines of the two joints are further inclined in opposite directions and aligned in a reversed manner.

When perfect, the formula for each period is as follows: 1:4:3:4:2:4:3:4:=8. About four periods occur between the tip of the claw and the lock spine. The primary spines (1) are the first to arise, and are consequently the oldest, as they are the largest in the series. The primary spines alone are developed as the first larval stage, and tend to increase in geometrical ratio, by the regular interpolation of new spines between those already formed, in a linear series. There is even a tendency to advance to the fourth progression, which if effected would give periods of sixteen. Spines of the second and third order begin to appear in the third larva, while in the fourth stage usually at least one eight-period series is developed.

During the larval stages tegumental glands open by capillary ducts on the proximal side of each spine, near its tip. The tips of the claws develop like setæ or 'hairs.'

At the fourth stage both large claws are similar and of the toothed type. Differentiation of the crushing claw begins at about the eighth molt, the large tubucles being formed by a fusion of periodic teeth.

The chelæ abound in tufts of tactile hairs, especially in early life, but show no other peculiar sense-organs. The 'fine meat' of the tips of the claws is a sponge-work of involuntary muscle-fibers, to which blood has access, and is adapted to meet the needs of the molting period, when great local changes in blood-pressure are demanded.

The periodic sequence of the teeth in the toothed type of claw may be regarded as of incidental significance only, in increasing the efficiency of a nicely adapted prehensile tool and weapon. Cases of symmetry which occasionally occur may represent a reversion to the primitive and larval type, in an incomplete stage in the reversal of asymmetry, and therefore concerned with

regeneration, like the phenomena observed by Przibram in *Alpheus*.

Torsion in the Crustacean Limb: FRANCIS H. HERRICK, Western Reserve University.

In crayfishes and lobsters the dactyles of the great claws face, and, therefore, open inward and in a nearly horizontal plane, while the smaller chelæ open upward and outward in a plane which is nearly vertical. In the lobster at birth, however, the chelæ, legs, great and small, all have the same form and position, that is, the laterally compressed claws all open vertically with an inclination outward. It, therefore, follows that the position of the great 'forceps' has been reversed by a rotation through 90°, in consequence of which their inner or anterior faces have become their under sides. With crayfishes, in which the metamorphosis is far more abbreviated, the adult form is already acquired at birth, so we may infer that this change has occurred in the embryo, for otherwise we should have to assume that the ancestors of the crayfish possessed another type of claw, which is not the case.

In the crayfish about one quarter of the weight of the animal is represented by the great chelipeds, while the proportional weight in the lobster is one half. The acquisition of size and strength in these limbs, and in *Homarus* the remarkable differentiation into toothed and crushing forceps of right or left sides, have been attended by a permanent torsion, which has chiefly affected the carpodite or fifth point. As can be clearly shown, however, this twisting is entirely independent of the form or weight of the claw. Meanwhile the eight slender legs have remained stationary, retaining their larval form and position.

The rotation of the chela in the lobster is completed at the fourth molt, which marks the most striking leap in the history of

development. The change is unquestionably of very ancient origin, and is probably older than autotomy, which precedes regeneration in certain limbs, since fusion of the second and third joints does not occur until after the fifth stage. It was already perfected during the Liassic period in the Erymoid crustacea, which are regarded as the direct ancestors of modern crayfishes and lobsters.

Torsion in the crustacean limb can not be explained on Lamareckian principles, since, owing to the peculiar structure of the segmented limb, with its fixed hinge joints, the muscles of a given segment can deliver only straight pulls on the next distal segment, which could not produce a torsion of the joint in which the muscles are lodged.

The theory of natural selection fares no better, for it is impossible to suppose that the torsion could have arisen gradually, through successive fractions of a degree, each position being more favorable than the last, and especially since in hundreds of crabs and prawns the claws open upward and outward. It seems more probable that the condition was acquired suddenly as a discontinuous variation, which has become adaptive in a minor degree.

The Growth of the Tail of the Japanese Long-tailed Fowl: C. B. DAVENPORT, Station for Experimental Evolution, Cold Spring Harbor, N. Y.

A preliminary report on the anatomy of the tail of the fowl and the morphologic basis of the long tail. A comparison of the tails of two brothers, one of which has had the tail feathers regularly stroked, the other not.

A Problem in Degeneration: CHARLES B. WILSON, State Normal School, Westfield, Mass.

The group of parasitic copepods affords one of the very best opportunities for

studying degeneration and the problems connected with it. For the phenomena are not exhibited here as isolated examples, but as a continuous series in which every step can be traced clearly. This, supplemented by a study of the life histories of the different species, gives a first knowledge of factors and conditions which aids greatly in the drawing of rational conclusions.

One of the problems is that which concerns the cause, or rather the causes of degeneration. Parasitism, while serving as a stimulus or ultimate cause, can not operate directly in producing degenerative changes. There must be other more immediate causes which operate in connection with it.

These immediate causes have been studied but very little; most writers are content with the mere statement that the disuse of a part or organ is what leads to its deterioration and ultimate loss. But evidently there must be some reason for the disuse, and then if its effects are to be permanent, and to go on accumulating until they result in the entire disappearance of the part, they must be capable of inheritance.

As a contribution towards the settlement of this and other vexed questions a careful study of the conditions and phenomena of degeneration has been undertaken in connection with the study of the morphology and habits of these parasites.

At present the study has extended over the family Argulidæ and the subfamily Caliginæ, with the following results:

1. The Argulidæ show no signs of degeneration; there are many modifications of organs in adaptation to new conditions, but nothing that could be called a deterioration. The reason for this is found in the fact that they do not carry their eggs in cases but deposit them upon some convenient surface. An act so important to the preservation of the species calls for a

complete preservation of all the powers possessed by free-swimming forms.

2. Of the Caliginæ, some show as little evidence of degeneration as the Argulidæ, while others furnish excellent examples of it.

The first step in this degeneration is a loss of the lunule, or sucking disks, on the frontal plates. Many causes contribute to produce this effect. The eggs are carried in cases and so retard locomotion; they are aerated by the movements of the host and so do not require movement on the part of the female; the best food supply is situated where there is the best aeration, so there is no incentive to movement.

3. The second step in degeneration is the assumption of a fixed position; here again several causes may be found. The larvæ are attached to the host by a frontal filament and after maturing have no incentive for moving about. On the disappearance of the lunules the second antennæ and second maxillipeds are enlarged and their claws serve for attachment organs. Claws can not be attached and loosened readily, but when once fastened securely there is a tendency to retain the hold.

The driving in of the claws makes a wound and causes a flow of blood, the food of the parasite; it is easier to lacerate the old wound than it is to make a new one; and again the deeper the wound the more plentiful the blood-supply.

4. The third step in degeneration is the modification of some part or organ in consequence of the fixed position. For each of these changes there are separate causes.

Notes on the Development of the Gill in Mytilus: EDWARD L. RICE, Ohio Wesleyan University.

The early development of the gill of *Mytilus* was worked out by Lacaze-Duthiers in 1856. To his account of the development of the earlier filaments the present

writer has nothing to add. As described, a papilla is formed, grows downward from the gill axis, and is reflexed on itself, giving rise to the familiar U-shaped filament.

Later filaments follow a very different scheme, there being no such bending of an originally simple filament. At the posterior end of the curiously curved gill axis a series of thin transverse ridges are developed. At first the edge of each ridge is entire; but growth is early checked in the center, so that the ridge is divided into two flat, rounded lobes, corresponding respectively to a filament of the outer and one of the inner gill plate. As each lobe elongates it becomes perforated at its proximal end, thus being resolved into the two branches of a U-shaped filament, identical in form with those first developed.

An interesting parallel is seen in the development of the interlamellar connections. The interlamellar connection, in its finished form, is a simple bar, containing a blood channel, and connecting the two branches of one filament. In an early stage of development the two branches of the filament are connected by a continuous plate of tissue, extending from the bend of the filament upward for a short distance. This stage is closely comparable with the adult condition in *Modiola* and *Arca*. Later a perforation appears in this plate, and the portion isolated above the perforation is transformed into the characteristic bar-like connection. The results derived from the study of isolated filaments have been confirmed by the study of sections.

The Effect of a Freezing Temperature on the Development of the Frog's Egg:
T. H. MORGAN, Columbia University.
No abstract.

Latent Characters and Reversion: W. E. CASTLE, Harvard University.

1. The coat of the wild guinea-pig contains at least two pigments, black and

yellow, on the same hairs. In certain varieties of domesticated guinea-pigs occur (a) black only, (b) yellow only or (c) neither pigment (albino variety).

2. These color types obey Mendel's law in heredity. In the order named (wild, black, yellow, albino), each type dominates all which follow it and is recessive to all which precede.

3. A recessive character disappears when brought into the same zygote with the corresponding dominant, but reappears distinct in half the gametes formed by the hybrid zygote. Hence recessive characters may exist unseen in individuals apparently dominant, but are bound to reappear if hybrid dominants are bred *inter se*.

4. Dominant characters also may exist unseen in recessive individuals, but the conditions of their reappearance are quite different. Such unseen (not recessive) characters may be called *latent*. Mating of recessives which contain latent dominant characters ordinarily produces only recessive individuals. Cross breeding with the dominant type is usually necessary to bring latent characters into activity, though in some cases where the latency was partial only, cross-breeding of two different recessive stocks has accomplished this result.

5. Albino guinea-pigs, mice and rabbits, transmit *latent* specific pigment characters (as black or yellow). This can be demonstrated by cross-breeding. Smooth-coated guinea-pigs may contain, in a condition of almost if not complete latency, the dominant rough or rosetted coat.

6. Reversion (or atavism) is a name which has been given to the reappearance in a race of lost ancestral characters. The matter has always been more or less mysterious, but would seem to consist in large part, if not exclusively, in the becoming active of characters which are latent. For this process cross-breeding seems normally to be essential, its function being either to

stimulate dormant potentialities into activity, or to bring together the isolated elements of a character which in its complex form has been lost.

Artificial Parthenogenesis in Thalassema mellita: GEORGE LEFEVRE, University of Missouri.

An investigation of artificial parthenogenesis in *Thalassema mellita* has shown that the eggs of this worm can be induced to develop into actively swimming trochophores, in the absence of sperm, by immersion for a few minutes in very dilute solutions of acids both inorganic and organic. Nitric hydrochloric, sulphuric, carbonic, acetic and oxalic acids were used successfully, and in favorable experiments 50-60 per cent. of the eggs developed into swimming larvæ that could scarcely be distinguished from normal trochophores of a corresponding stage.

An egg membrane invariably forms shortly after removal from the acid solutions, and maturation, identical with the normal process, frequently occurs. In a number of cases, however, polar bodies were not extruded, but the eggs divided and eventually gave rise to trochophores without any external indication of maturation. On sectioning such eggs it has been determined that the maturation process occurs internally, the polar mitoses taking place below the surface and without accompanying cytoplasmic division. The result is that, in some cases at least, four resting nuclei are formed in the cytoplasm of the egg which represent the egg-nucleus and the nuclei of the three polar bodies. These four nuclei then come together and fuse to form a cleavage-nucleus, which, therefore, contains, in addition to the chromatin of the egg-nucleus, all the chromatin that would have passed into the polar bodies, had they been extruded.

The egg-centrosome disappears after the

formation of the second polar body, and the cleavage-centrosomes arise *de novo*.

It has frequently been observed that the polar bodies continue to divide, with the result that they form a morula-like cluster of minute cells.

Cell-divisions take place mitotically, and in many cases the early cleavage is perfectly normal, although a great variety of abnormal cleavages also occur.

The larvæ arising parthenogenetically are strikingly normal in appearance and structure and exhibit the usual differentiations characteristic of the normal larvæ of a corresponding stage of development, digestive tract and mouth, prototrochal band, apical plate and flagella, etc.

Further Experiments on Self and Cross Fertilization in Ciona: T. H. MORGAN, Columbia University. No abstract.

A Few Words on What is to be Understood by 'Good' Fixation: ALEXANDER PETRUNKEVITCH, Harvard University.

The question of what is to be understood by 'good' fixation is of both theoretical and practical value. Authors disagree as to how much of what we observe under the microscope is artefact and consequently as to the trustworthiness of the conclusion drawn from it. In my opinion, as fixed material consists in artefacts only, we should learn to eliminate errors by comparison. Two errors are especially to be shunned: mistaking for true, (1) structures which result from a dislocation of cell-organs, (2) those created by the use of injurious agents. Pauli placed the alveolar structure of protoplasm in the latter group, demonstrating that colloids show no separation into two 'phases' when a normal solution of urea is added to the fixing liquid. I repeated his experiments with a great variety of agents, some of them never used before. The results are the opposite of those obtained by Pauli.

A good fixing liquid ought to have the following qualities: (1) to produce no dislocations, (2) rapid penetration, (3) to cause no overhardening, (4) not to impair staining capacity.

As a fixing liquid for general use which fulfills these requirements I recommend the following mixture:

Alcohol absol.....	200
Water	300
Glac. acetic acid.....	90
Nitric ac. pure conc....	10
Corrosive sublimate...	55 (saturated).

The objects are put in this liquid for a period of from 6 to 24 hours, then washed in 70 per cent. alcohol with iodine which must be frequently renewed; after this they can be kept indefinitely in 70 per cent. alcohol.

*The Formation and Behavior of the Microzooids of *Hæmatococcus pluvialis*:*
FLORENCE PEEBLES, Woman's College.

Under normal conditions the resting cells of *Hæmatococcus* produce more macrozooids than microzooids. If, however, the dead leaves and other objects upon which they live are subjected to frequent periods of rapid desiccation the number of microzooids formed is greatly increased. These microzooids can be obtained in large quantities if the mother cells are subjected, in the early stages of division, to cold and then suddenly changed to a warm temperature; or, if kept at first in the dark, and then placed in direct sunlight. They are positively heliotropic and gather in swarms on the side of the vessel that is nearest the light.

After escaping from the mother cell a microzooid swims about for twelve to forty-eight hours and then comes to rest, loses its flagella, develops a cell wall and begins to grow. After a day or two, the first cell wall is cast off and a new one forms. A large number of microzooids

have four flagella, others two. Those with four have exactly the same shape but are larger than those with two. Many double individuals have been observed, and these after a short time fuse into one normal spore. Although no two microzooids have been found in the first stage of conjugation, it seems highly probable that they are gametes, and that under certain conditions conjugation takes place, and that the zooids with four flagella are zygospores.

The Evolution of Color-producing Structures in Birds: R. M. STRONG, University of Chicago.

The colors of feathers from between seven and eight hundred birds were studied. The causes of colors in feathers, the nature of color characters and the evolution of color in birds were considered.

The material studied argues strongly in favor of the orthogenetic theory of evolution of color pattern by continuous variation, advocated by Professor Whitman. A great many peculiar modifications in structure and pigmentation occur in birds. Some of these produce color phenomena which often seem, at first, to be unrelated to other colors found in birds. These studies have demonstrated, however, that a perfect continuity exists between color characters. Complete series of intergrading conditions occur in single feathers, at the margins of color areas, and in allied species.

Extreme developments, like the phenomenon of iridescence, occur very generally in bird feathers, but often in incipient stages not observable except with the aid of the microscope. Colors involving complete differentiations in structure and pigmentation sometimes appear in amounts too small to effect the total color impression received by the unaided eye. These color phenomena are ordinarily perceived only when they are produced by a large propor-

tion of the feather elements for a given area on the feather.

New color characters first appear at the extreme distal end of the feather, and they may move proximally, encroaching upon other characters. Likewise new characters appear first at the distal ends of the barbules.

The History of the Germ-Cells in Pedicellina americana: LOUIS I. DUBLIN, Columbia University.

In this study the attempt was made to work out as fully as possible the history of both egg and sperm, with especial reference to the chromatin, and to compare this with the character of the chromosomes in the various somatic tissues—thus covering the entire life history of the individual. The number of chromosomes is twenty-two. These are, in the various somatic cells and in all but the last generation of oogonia and spermatogonia, distinct Vs in shape. In this last generation, however, the chromosomes are converted into rods and from the size relations, it is very probable that these have arisen through the extension of the angle in the preceding Vs to 180°. These rods split in the metaphase and passing to the poles give rise to eleven, or the reduced number of new Vs. From the rather full evidence, more particularly in the sperm history, it is beyond question that these new figures have arisen by the end to end union of the rods at the telophase of the last spermatogonial and oogonial divisions. This is for *Pedicellina* the true synapsis, and the conversion of the chromosome form from Vs to rods is in preparation for it, thus strikingly confirming the results of Montgomery and Sutton. The eleven loops thus formed grow rapidly, split longitudinally and then become extended into nearly straight thin parallel threads, the synaptic point being at the middle. The chromosomes now contract

and form themselves into double rods, ellipses and rings, and as such enter into the first maturation spindle. From the complete history of the individual chromosomes up to this point and the ease with which the synaptic point may be followed this division is undoubtedly the reducing one, separating the chromosomes which had united at the synapsis. The second division is longitudinal and the maturation processes are completed.

Color Changes in Anolis: G. H. PARKER and S. A. STARRATT, Harvard University.

Anolis carolinensis, according to Carlton, changes in the dark from brown to green in about twenty-five minutes, and in the light from green to brown in about four minutes. Temperature, however, was found to influence this rate. Thus in the dark at 10° C. the lizards remained brown; at 20° they changed to green in about 20 minutes; at 25° in about 13 minutes; at 30° in about 11 minutes; at 35° in about 15 minutes; and at 40° and 45° they were always green. In the light at 10° they also remained brown; at 20° they turned brown in a little over 4 minutes; at 25° in about 3.5 minutes; at 30° in a little over 3 minutes; at 35° in about 2.8 minutes; and at 40° and 45° they were always green. Thus a low temperature induces brown and a high one green and both are independent of illumination.

The changes from green to brown and the reverse take place at temperatures where light is an effective stimulus when the lateral eyes and the pineal eye are artificially covered. A beam of light about a millimeter in diameter and thrown upon the skin is all that is necessary to induce the change from green to brown. The nerves of the skin of *Anolis* must, therefore, be sensitive to light.

Organ-forming Substances in the Eggs of Ascidians. Illustrated by Photomicro-

graphs of Living Eggs by Katharine Foot and Ella C. Strobell: EDWIN G. CONKLIN, University of Pennsylvania.

Three very different kinds of protoplasm may be observed and photographed in the living oocytes and unsegmented eggs of *Cynthia partita*; these are the yellow *mesoplasm* which later enters into the mesoderm, the gray *endoplasm* which gives rise to the endoderm, and the transparent *ectoplasm* which becomes ectoderm. Three additional differentiations are visible and have been photographed before or immediately after the first cleavage, viz., the mesoplasm is differentiated into a deep yellow substance, the *myoplasm*, which gives rise to the muscles of the larva and into a light yellow material, the *chymoplasm*, which becomes mesenchyme; there is also recognizable an area of light gray material, the *chorda-neuroplasm*, which develops into the chorda and neural plate of the larva.

As early as the close of the first cleavage all of these substances are localized in the egg in positions corresponding to those which they will occupy in the embryo or larva; the mesoplasm forms a yellow crescent around the posterior side of the egg dorsal to the equator, the chorda-neuroplasm takes the form of a gray crescent around the anterior half of the egg, the endoplasm lies between these two crescents at the dorsal (vegetal) pole of the egg, the ectoplasm occupies the ventral (animal) hemisphere. The dorsal border of the yellow crescent consists of light yellow protoplasm (chymoplasm), which gives rise to the mesenchyme of the trunk, while a similar area of light yellow or clear chymoplasm lies at the middle of the crescent behind and ultimately forms the caudal mesenchyme of the larva. All of these areas and substances can be followed with ease and certainty throughout the development until they enter into the principal

organs of the larva, a fact which is beautifully shown by the photomicrographs.

Experimental Studies on the Ascidian Egg: EDWIN G. CONKLIN, University of Pennsylvania.

That the various areas and substances of the ascidian egg are actually organ-forming ones may be demonstrated by experiment. Operations on the unsegmented egg inhibit development, but when certain blastomeres of the cleavage stages are killed or injured the ensuing development of the uninjured blastomeres is strictly partial; in no case do such blastomeres give rise to other organs than those which they would have produced under normal conditions. Conversely, if the cells which contain the myoplasm are destroyed the resulting larva has no muscle cells; if the cells containing the chorda-neuroplasm be removed there will be no chorda nor neural plate in the resulting monster; the same is also true of the ectoplasm and endoplasm.

Since all these substances are divided bilaterally at the first cleavage, each of the first two blastomeres contains one half of all of the organ-forming substances, and inasmuch as isolated blastomeres of the ascidian egg produce rounded masses of cells which tend to close over the injured part, it frequently happens that the half embryo or larva bears a superficial resemblance to a whole one; however, a study of their cell-lineage and later development shows that they are still half embryos and larvæ. When the egg is injured along any other plane than the median one nothing even remotely resembling a normal larva is ever produced.

Prophases of the First Maturation Spindle of Allolobophora fætida: KATHARINE FOOT and E. C. STROBELL.

At the end of the growth period, the chromatin granules which are distributed

throughout the germinal vesicle segregate into an extremely fine spireme. This spireme becomes shorter and thicker, and shows a distinct longitudinal split. It then divides *transversely* into eleven bivalent chromosomes, *i. e.*, in each case two univalent chromosomes remaining attached end to end. There is no conjugation of univalent chromosomes; it is merely a question of two univalent chromosomes already attached in the spireme remaining so, this causing the numerical reduction to half the somatic number.

The two univalent chromosomes of each of the eleven bivalent chromosomes are still attached end to end at the metaphase of the spindle, and the longitudinal split seen in the spireme of the earlier stage persists until this period, causing typical tetrads, *i. e.*, bivalent chromosomes with a longitudinal and a transverse furrow. These chromosomes separate along the line of the *transverse* furrow (which indicates the point of attachment of two univalent chromosomes). *Allolobophora* thus supports the observations of Korschelt in the annelid *Ophryotrocha*, and Montgomery and others who maintain that the first division separates univalent chromosomes and is, therefore, a reducing division.

There are two nucleoli in each germinal vesicle, the relatively large *principal nucleolus*, and the smaller *accessory nucleolus*, and neither appears at any time to be a storehouse for the chromatin which forms the chromosomes. The principal nucleolus disappears before the spindle is formed, but the accessory nucleolus may persist until much later.

We interpret the accessory nucleolus as the precocious appearance of the nucleolus of the oocyte of the second order. If, as held by a number of investigators, the chromosomes of one division are in some manner related to the nucleolar substance of the following rest stage, may not this

take place at an earlier period, and the accessory nucleoli of the germinal vesicle be a precocious appearance of the nucleoli, which are so conspicuously absent between the first and second maturation spindles, the processes involved in the rest stage occurring before instead of after the first division, and the origin and growth of the accessory nucleolus being part of them? The second division precociously foreshadowed in the four-part chromosome of the germinal vesicle suggests a precedent for this interpretation.

A Quantitative Study of Holothuria atra Jäger and the Reestablishment of Holothuria floridana Pourtalés (=Holothuria mexicana Ludwig): CHARLES LINCOLN EDWARDS, Trinity College, Hartford, Conn.

Jäger, 1833, described *H. atra* from Celebes. Pourtalés, 1851, described *H. floridana* from Florida. Semper, 1868, gave *H. floridana* as a synonym of *H. atra* and since then all authors have followed Semper. Ludwig, 1875, described *H. mexicana*. Clark, 1901, gave Porto Rican specimens as *H. mexicana*. Ten of these specimens identified by Clark are included in my statistics and they are *H. floridana* as defined in this paper. Statistical analyses of 138 specimens, 20 from the Sandwich Island-Mozambique and 118 from the Florida-Caribbean region clearly demonstrate that *H. floridana* Pourtalés should be reestablished as a species distinct from *H. atra* Jäger, and that *H. mexicana* Ludwig is a synonym of *H. floridana*. In general, biometry offers a most important method in taxonomy for determining the extent of variation and, therefore, of the best (least variable) specific characters and their proper definition, together with the separation of growth from adult characters. The following comparison gives in brief résumé the chief differential characters:

H. atra.

Color mostly uniform seal-brown.

'Pits' in skin. No 'warts.'

Skin flaccid. 1-1.5 mm. thick. 25 per cent. of dorsal ambulacral appendages are pedicels; the rest papillae. 5 types of calcareous end-plates from large, well developed, associated with the cylindrical pedicels to small, vestigial with the conical papillae.

Calcareous rosettes like crosses; central rod elongated. Longer, broader and more delicate.

Of 300 rosettes 2 had 3 holes, 4 had 2 holes and 19 had 1 hole. No well developed plates.

H. floridana (= *H. mexicana*).

Color very variable. Shades of brown like seal, clove, Vandyke, etc., and of gray, cream, buff, etc. Often beautifully marbled. Young generally lighter.

'Warts,' each a heap of spicules usually surmounted by a conical papilla, generally present, especially in young. No 'pits.'

Skin firm, 2-5 mm. thick. 80 per cent. of dorsal appendages are pedicels; of the remainder not all are true papillae. Much larger percentage of well developed end-plates, only 1 case of the fourth and none of the fifth type.

Calcareous rosettes stellate; central rod short; branches blunt. Twice as thick as those of *H. atra*. Growth stages of the perforated plates.

Special types of 4- and 8-hole plates, together with other incomplete plates, are growth stages of the fully developed plates which have 4-31 holes; mean 13-14 holes.

The number and length of polian vesicles and of stone-canals increase with age. Seventy-one per cent. of the young *H. floridana* have only 1 polian vesicle, while in the adult the number ranges from 1 to 92. The total number of stone-canals in *H. floridana* ranges in the young from 2 to 25; in the adult, from 5 to 149.

On Some Points in the Natural History of the Oyster: RAMSAY WRIGHT, University of Toronto.

The author, who has been directing the Marine Biological Station of Canada at Malpeque, Prince Edward Island, during the last two summers, exhibited some photographs in illustration of his paper. The first showed that the kidney is a much more conspicuous system of branched tubes, at least during the spawning season, than is generally supposed. The tubes extend into the pericardial wall, and into the mantle in the neighborhood thereof.

Photographs of the male and female genital ducts showed that it is possible in ripe individuals to recognize the sexes without examining the genital products. It was stated that while in oysters of three

or four years' growth the sexes are equally divided, 90 per cent. of one year old oysters, which are already sexually mature, are males, a circumstance which seems to point to the protandry which has been asserted of the American oyster. A more exhaustive study of this point is required.

The occurrence of *Urastoma* (better, *Urostoma*) *cyprina*, Graff, a commensal turbellarian, was recorded from the oyster. It has hitherto been observed in *Cyprina islandica* from the Baltic, *Mytilus edulis* from the White Sea, and in *Solen vagina* from Trieste.

*Diversity in the Scutes and Bony Plates of Chelonia:** R. E. COKER, Johns Hopkins University.

I. *Scutes*.—There is a remarkable degree of diversity in the number and arrangement of the scutes of the carapace and plastron of certain species of *Chelonia*, notably *Malaclemmys centrata* (Latr.) and *Thalassochelys caretta* (L.). Of 244 specimens of *Malaclemmys*, 109 were abnormal in scutes; 20 per cent. had either more or less than the typical number of carapace scutes. About one half of the abnormal specimens were asymmetrical.

Neither in observations on *Malaclemmys* nor in those on 26 embryos from a single nest of *Thalassochelys*, was support found for Gadow's theory of 'orthogenetic variation.' For example, the embryos averaged, per carapace, a fraction less than the typical number of scutes.

Rare instances are found of a peculiar form of variation that may be termed 'orthogenetic.'

II. *Correlation*.—The normal correlation of scutes and plates is, roughly, a modified alternation, the alternation being especially simple in the marginal series. The corre-

* Presented with the permission of Hon. Geo. M. Bowers, U. S. Commissioner of Fish and Fisheries.

spondence of marginal plates with sutures between scutes is retained in several shells abnormal in the marginal region. In the costal series the seventh forms an exception: but it harmonizes with the others falling into the alternating series, and bearing the triradiate impression of scute sutures in several specimens that have a supernumerary neural in the posterior region. In shells abnormal as regards scutes, the normal condition of correlation may tend to be preserved by associated (correlated) abnormalities in bony plates.

The presence, in correlation with supernumerary scutes, of a ninth costal plate may be an atavism. In such cases observed, the tenth rib, instead of as normally ankylosing with the ninth rib and eighth costal plate, enters into the ninth costal plate; so that each dorsal rib, except the first, forms part of a plate.

More complete results, with drawings and photographs, are in preparation for publication.

On the Nature and Behavior of the Morphogenous Substances in the Egg of Chætopterus: FRANK R. LILLIE, University of Chicago.

Eggs of *Chætopterus* may be stimulated to undergo differentiation of certain kinds without the process of cleavage by a variety of methods. Such unsegmented ova develop cilia and swim about actively. The protoplasm is vacuolated like that of the normal larvæ and the yolk is aggregated in a manner resembling that in the normal development.

Careful examination of this mode of development, however produced, showed that it proceeds by the segregation and differentiation of substances readily distinguished by their optical properties and by their behavior. The sequence of events is somewhat obscured and complicated by amoeboid movements of the protoplasm, but

is essentially the same in all ova. Five separate substances may be readily distinguished, arranged like a series of strata, prior to the appearance of the cilia; one of these overflows the remainder and cilia develop from this layer alone, which is characterized by the presence of peculiar granules.

The same substances may be recognized in the normal unsegmented egg where they have a different arrangement, and they may be followed in the normal development. They thus appear to be specific in their morphogenic properties, both in the normal and in the modified development. Morphologically these substances are distinguishable only by differences in the size, arrangement and microchemical reactions of the larger spherules, and not at all by local differentiation of the microsomes or ground substance of the protoplasm. The conclusion appears inevitable that in *Chætopterus* at least, the differences between specific morphogenic substances are dependent, certainly in part, on the nature of the spherules contained.

The observations led to the conclusion that these spherules exhibit attractions and repulsions among themselves, which may, to a great extent, explain their segregation and arrangement.

The spherules have all been lumped together as 'yolk' in the egg of *Chætopterus*. In other animals, also, is the so-called yolk really a mixture of various substances? It is in any event certain that we have no precise criterion of yolk in holoblastic eggs, and one is badly needed.

The Structure of Bothriolepis, with Exhibition of Specimens of Devonian Fishes of Canada: WILLIAM PATTEN, Dartmouth College.

This paper was based on a large collection of new material recently acquired by the author from New Brunswick. Numer-

ous specimens illustrating the mode of life and especially the structure of the mouth-parts were exhibited.

The Color-Pattern of Nanemys guttata Schneider (a preliminary report): ROBERT M. YERKES, Harvard University.

1. The young of this species of tortoise usually have a single yellow spot on each plate of the carapace, except the marginals. With age the number of spots increases, they appear on the marginal plates also, and their arrangement becomes irregular.

2. The epidermal layer is transparent immediately over the mass of yellow pigment in the outer bony layer, hence, window-like regions in the outer portion of the shell.

3. Although the females are slightly smaller than the males they usually have about 15 per cent. more spots on the carapace. The average number for the males is 60, for the females 69. This would seem to indicate that the brightly colored spots serve as both sex and species marks. Probably they serve to render the females conspicuous.

4. Statistics indicate a greater number of spots on the left side of the carapace than on the right in both males and females. It is possible that this is to be correlated with right-handedness and right-eyedness.

Chromosome Vesicles in the Maturation of Nudibranchs: W. M. SMALLWOOD, Syracuse University.

Between the anaphase of the first maturation and the prophase of the second the chromosomes pass through some important changes. The first indication of the presence of vesicles is noted at about the time that the young amphiasier of the second maturation figure is forming and moving into a radial position. At this time a dis-

tinct membrane appears around each chromosome, which lies so close to the chromosome as to be overlooked in some instances. It frequently happens that one chromosome vesicle contains two or more chromosomes, in which case the chromosomes are united by narrow strands of chromatin.

The chromosomes do not always pass into vesicles, but go through the well-known changes as described for other molluscs, annelids, etc.

During the prophase of the second maturation the solid chromosomes enclosed in vesicles may lose their reaction to basic stains almost entirely, with the result that each vesicle represents in miniature a nucleus having chromatic granules, linin threads and an achromatic substance. After this condition the granule, or granules, within the chromosome vesicle increases in size until it has the normal appearance of a chromosome lying in the cytoplasm. It is an open question as to the fate of the surrounding vesicle.

The fibers constituting the second maturation spindle are formed in part of the eggs from the cytoplasm after the spindle has taken a radial position and the centrosomes are fully differentiated into centriole and centropiasm.

The chromosomes which pass into the first and second polar cells may each have a separate vesicle or all of the chromosomes may pass into one vesicle. All combinations between these two extremes occur.

These and similar results on *Haminea* suggest that the chromatin passes through a liquid state during maturation, at which time there may be a complete chemical rearrangement of the molecules in the chromosome, which, if it were true, would interfere to some extent with the theory of the qualitative division of the chromosomes.

The complete paper will appear in the *Morphologisches Jahrbuch*, Bd. XXXIII.

Experimental Studies of Adaptation and Selective Elimination in Fishes: FRANCIS B. SUMNER, College of the City of New York. No abstract.

Habits and Reactions of Crabs bearing Actinians in their Chelipeds: J. E. DUERDEN, University of Michigan.

Möbius in 1880 first made known the fact that the crab, *Melia tessellata* Latr., has the remarkable habit of carrying a living actinian in each claw. The polyps are carried about in front of the crab, held in a kind of defensive attitude, and it is assumed that the actinians, by means of their stinging threads, may be useful to the crab for purposes of offense and defense, while the activity of the crab may serve to bring the actinian into the neighborhood of more prey. During a recent visit of the writer to the Hawaiian Islands, under the auspices of the Carnegie Institution, two specimens of *Melia*, both bearing an actinian in each claw, were collected, and observations made upon their habits and reactions. These may be summarized as follows:

1. The commensalism is not restricted to a single species of actinian. One crab carried a *Bunodeopsis* and the other a *Sagartid*. The species are interchangeable, and the crabs will dislodge a small polyp to take up a larger. Apparently the crab is not aware of the presence of an actinian until it comes in actual contact with it; dislodgment of a fixed actinian is brought about by means of the first pair of ambulatory limbs.

2. When irritated the crab moves its chelipeds so as to place the actinians in such a position as to best serve as a means of defense. Food given the polyps is abstracted by the crab by means of its first pair of walking limbs, the stimulus to activity being probably derived from the diffusion of the meat juices.

3. *Melia* has lost the direct use of its

chelipeds as organs of defense and offense, or for grasping objects other than the actinians; in correlation with this the functions of the first ambulatory appendages have become largely modified.

4. A second species of crab, *Polydectus*, was also found which bears an actinian, *Phellia*, in its chelipeds.

On the Structure of the Larval Oyster and its Occurrence in the Plankton: JOSEPH S. STAFFORD, McGill University. Read by title.

A Statistical Study of Correlation and Selection in Lepidoptera: HENRY E. CRAMPTON, Barnard College. Read by title.

HENRY S. PRATT,
Secretary.

SCIENTIFIC BOOKS.

Vorlesungen über Pflanzenphysiologie. LUDWIG JOST. Jena, Gustav Fischer. 1904. Pp. xiii + 695; 172 figures.

In the form of forty odd lectures the author presents a comprehensive view of the whole field of plant physiology. In the preface he states that it is his purpose to supply, in this volume, a book for the student, which will fill the gap between Pfeffer's exhaustive treatise and the short accounts found in various general text-books. In this he has succeeded and has filled a long-felt want for the reader who wishes a full, but not too detailed, account of the important facts and problems of plant physiology. There is a departure from the usual mode of treatment, in that the subject is divided under three main heads, instead of two. The first of these concerns the chemistry and nutrition of the plant and occupies somewhat less than half of the book. The rest is about equally divided between a section entitled 'Formwechsel,' treating of growth and reproduction, and another entitled 'Energiewechsel,' which has to do with movements of both growth and locomotion.

In general the treatment of nutrition does not differ materially from that of many other books, except that it is fuller. Under the general term assimilation is considered both

photo-synthesis and the assimilation of nitrogenous substances. This is to be regretted, for it fails to bring out the essential differences between these forms of chemical activity within the plant. This is especially true since the author follows the fate of the nitrogenous products up to the point of the final construction of albuminous material and even considers the processes of digestion before a word has been said about respiration and the accompanying phenomena. It is true that in the following section, on dissimilation, as the author terms it, the phenomena connected with respiration are spoken of from the standpoint of the release of kinetic energy, but the importance of this in the upbuilding processes in nitrogen assimilation is not sharply brought out. The first part, on nutrition, closes with a cleverly constructed diagram which brings out the origin and fate of the various substances connected with nutrition processes.

In the already noted division of the balance of the book into two parts, it is not altogether evident that there is much advantage over the more usual plan. The problems connected with the change in form, in short the growth of the plant, are in many ways intimately connected with growth curvatures, yet in the arrangement followed the former are included under 'Formwechsel,' the latter under 'Energiewechsel.' If this treatment tends to draw the attention of the student from the relation of expenditure of energy to ordinary growth phenomena, or if thereby growth curvatures—tropism—are separated too sharply from unmodified growth responses, it seems to hinder rather than help the proper appreciation of the question as a whole. Some subdivision is certainly an advantage, but it might have been better if the title 'Energiewechsel' had been used for both of the sections and suitable subtitles devised to indicate more adequately the different phenomena.

Aside from such points, which are, perhaps, after all, but matters of opinion, there can be no question but that the book is an excellent one. It is clear, concise, fairly up to date as regards the literature, and, moreover, written in a style which makes it attractive and interesting reading. One can but regret that there

is not a book in the English language so suitable for the student; it is to be hoped that a translation will appear.

COLUMBIA UNIVERSITY. H. M. RICHARDS.

Cleioocrinus. By FRANK SPRINGER. *Memoirs Mus. Comp. Zoology*, Harvard College, Vol. XXV., No. 2, January, 1905.

A few years ago the Museum of Comparative Zoology brought out Mr. Springer's beautiful and exhaustive account of *Uintacrinus*, and now we have before us a similarly complete paper on one of the oldest of known Crinoid genera—*Cleioocrinus*. This genus was described by E. Billings in 1856, from specimens found in the Lower Silurian at Ottawa, Canada. It has been discussed by various authors, who have had great difficulty in placing it in the system of classification, owing partly to its anomalous character, and partly to the condition of the specimens. In 1886 Messrs. Wachsmuth and Springer wrote: 'If certain parts were better known, we should make it the type of a new family, but at present, having no positive knowledge of the basal regions, nor even of the arms, we are not in a position to give a satisfactory definition of the group.' Mr. Springer does not now establish the family *Cleioocrinidae*, in so many words, but it is evident that the expectations of 1886 have been more than realized. The story of the discovery of the new characters is so dramatic that it is worth quoting nearly in full:

It was apparent, however, that no further information was to be obtained, unless we could find some means of seeing what is underneath the column. My examination of the specimens gave no hope of being able to detach the column in either of them; but after a very careful study of specimen B [one of Billings's types borrowed from the Geological Survey of Canada], under a strong magnifier, I came to the conclusion that it might be possible to get at the inside of the base by removing a part of the plates above it. * * * * The small size of the specimen and the uncertainty as to how the fractures might run, rendered the operation a delicate and risky one to undertake with a type specimen; but I thought the benefit to be gained in case of success would warrant the risk. I accordingly laid the matter fully before Dr. Whiteaves, and requested his

authority to undertake it. This he gave without hesitation, and in the most liberal manner, leaving me free to act with the specimen as if it were my own. * * * The work of removing the necessary plates and debris from above the base of the specimen was tedious and difficult, being performed entirely under a ten-power microscope, with tools specially fashioned out of needles and fine steel pens. It was completely successful, however, without any mishap, and disclosed a structure most extraordinary and anomalous, unlike any of the previous suppositions, and wholly at variance with that of any other known crinoid.

It is finally concluded that the genus is intermediate between the great groups of Flexibilia and Camerata; nearest, apparently, to the Reteocrinidæ. The memoir is illustrated by a beautiful plate of drawings by K. M. Chapman and E. Ricker, showing not only all aspects of *Cleiocrinus*, but also *Reteocrinus* and *Glyptocrinus* for comparison.

T. D. A. C.

SCIENTIFIC JOURNALS AND ARTICLES.

THE *Journal of Experimental Medicine* established by Dr. W. H. Welch, of the Johns Hopkins University, will hereafter be published under the auspices of the Rockefeller Institute for Medical Research, and will be edited by Drs. Simon Flexner and Eugene L. Opie. The scope of the *Journal* will suffer no alteration by reason of the change of management, and it is hoped that it may continue to cover, as heretofore, the field of experimental medicine. It is proposed to issue numbers of the *Journal* at bimonthly intervals, six numbers to constitute a volume, which will contain not less than six hundred pages.

THE opening (January) number of volume 6 of the *Transactions of the American Mathematical Society* contains the following papers:

P. F. SMITH: 'On the linear transformations of a quadratic form into itself.'

E. V. HUNTINGTON: 'A set of postulates for real algebra, comprising postulates for a one-dimensional continuum and for the theory of groups.'

W. A. MANNING: 'On the primitive groups of class 3p.'

L. E. DICKSON: 'The minimum degree τ of resolvents for the p -section of the periods of hyperelliptic functions of four periods.'

G. A. MILLER: 'Determination of all the groups of order 2^m which contain an odd number of cyclic subgroups of composite order.'

E. D. ROE: 'On the coefficients in the quotient of two alternants.'

E. J. WILCZYNSKI: 'General theory of curves on ruled surfaces.'

O. VEULEN: 'Theory of plane curves in non-metrical analysis situs.'

The *Museums Journal* of Great Britain for January contains the second part of an article on 'School-Children and Museums,' by Henry Coates and Alex. M. Rodger, and 'The School Nature-Study Union,' under which is given a list of the museums, zoological and botanical gardens, in and about London and the facilities they afford teachers and students. There are a description of the Liverpool Museum as now arranged and a large number of notes about museums. Like *Nature* the *Museums Journal* is particularly strong in its notes, which form a most important portion of any scientific journal.

SOCIETIES AND ACADEMIES.

THE NEBRASKA ACADEMY OF SCIENCES.

THE fifteenth annual meeting of the Nebraska Academy of Sciences was held in the Hall of Mechanic Arts, State University, Lincoln, January 27-28, and included a business session, sessions for the reading of papers and a social session on the evening of the latter date.

The following papers were presented:

PROFESSOR H. B. DUNCANSON: President's Address: 'The Relation of the State to Scientific Investigation.'

DR. H. H. WAITE: 'The Duty of the State to the Public in the Prevention of Certain Diseases.'

DEAN H. B. WARD: 'Some Observations on the Biological Conditions of Elevated Lakes' (with lantern).

PROFESSOR O. V. P. STOUT: 'An Economical Design for Measuring Flumes.'

DR. G. E. CONDRA: 'The Possible Development of Nebraska's Stone-quarrying Industries.'

PROFESSOR F. D. HEALD: 'Preliminary Note on a Black Rot of Apples.'

DR. R. H. WOLCOTT: 'A New Mite Affecting Greenhouse Plants.'

PROFESSOR B. E. MOORE: 'A Color Study of Cobalt Solutions.'

PROFESSOR L. BRUNER: 'Some New Nebraska Orthoptera.'

PROFESSOR G. E. CHATBURN: 'The Quality of Nebraska Timber.'

DEAN CHAS. FORDYCE: 'Additional Notes on the Cladocera of Nebraska.'

PROFESSOR F. D. HEALD: 'A Convenient Incubator for Student Work.'

PROFESSOR W. A. WILLARD: 'The Zoology of the Bermudas' (with lantern).

PROFESSOR W. W. HASTINGS: 'A Preliminary Report on the Respiratory Function.'

MR. F. D. BARKER: 'Some New Avian Parasites' (with lantern).

PROFESSOR F. D. HEALD: 'A Disease of the Cottonwood.'

PROFESSOR G. R. CHATBURN: 'Thoughts on Highway Improvement.'

DR. S. R. TOWNE: 'How Typhoid is Spread.'

PROFESSOR J. H. POWERS: 'Causes of Color variation in the Amblystoma.'

DEAN C. E. BESSEY: 'Observations on Planted Forests in Europe.'

MR. G. A. LOVELAND: 'The Effect of the Rotation of the Earth on Wind Direction.'

DEAN E. W. DAVIS: 'How the Wind Changes its Direction.'

MR. A. E. SHELDON: 'Some Prehistoric Indian Fire-places in the Bad Lands' (with lantern).

DR. R. H. WOLCOTT: 'Some Observations on the Fauna of Nebraska' (with lantern).

MR. E. E. BLACKMAN: 'New Types of Nebraska Flint Implements' (with lantern).

DR. G. E. CONDRA: 'Delimitation of Nebraska's Coal-bearing Formations' (with lantern).

Aside from the routine business which was transacted, resolutions were offered and passed endorsing legislation for the protection of non-injurious large game and other animals and also approving of the setting aside of forest and game reserves under government control.

The following officers were elected for the ensuing year:

President—Dr. R. H. Wolcott, University of Nebraska, Lincoln.

Vice-President—Dr. S. R. Towne, Nebraska State Board of Health, Omaha.

Secretary—Professor F. D. Heald, University of Nebraska, Lincoln.

Treasurer—Mr. A. E. Sheldon, Lincoln.

Directors—Mr. William Cleburne, Omaha; Dr. James B. Hungate, Weeping Water; Professor G. R. Chatburn, University of Nebraska, Lincoln;

Professor G. A. Loveland, University of Nebraska, Lincoln.

ROBT. H. WOLCOTT,
Secretary.

THE NORTHEASTERN SECTION OF THE AMERICAN CHEMICAL SOCIETY.

THE fifty-seventh regular meeting of the section was held Friday evening, January 27, at the 'Tech Union,' Massachusetts Institute of Technology, with President Norris in the chair. About sixty members were present.

Professor Frank H. Thorp, of the Massachusetts Institute of Technology, gave a paper entitled 'Some Notes upon Recent Foreign Literature of Chemical Technology.'

Mr. Arthur D. Little gave an eulogistic address on the 'Life and Work of the late Dr. Carl Otto Weber.' ARTHUR M. COMEY,
Secretary.

THE GEOLOGICAL SOCIETY OF WASHINGTON.

THE 163d meeting of the society was held on Wednesday evening, February 8, 1905. Messrs. David White, M. L. Fuller and W. T. Schaller presented informal communications, and the regular program was as follows:

Notes on the Fossils of the Bahamas: Mr. W. H. DALL.

The rocks of the Bahamas, apparently all Pleistocene, are of two kinds, marine sedimentary and æolian calcareous sands. The former contain the common marine West Indian shells now living about the Bahamas, with no extinct species. The æolian rocks proved to contain quite a fauna of land shells, especially characterized (like the recent land fauna) by the profusion of *Cepolis* and *Cerion*. In this respect it recalls the Oligocene land shell fauna of the Tampa silex beds, of which the Bahama Pleistocene shells are an analogue but not a derivative. The latter unexpectedly proved to contain a number of extinct species, doubtless the ancestors of the present fauna. Curiously enough, these ancestral forms are more like existing species of Haiti and Cuba than they are to their actual descendants, which may be accounted for on the hypothesis that a great increase in variability accompanied their invasion of the newly elevated

land where there were no competitors, while the Haitian and Cuban forms from which they sprang have been kept true to type by the competition of the rest of the fauna by which they are surrounded. If there were any way of determining approximately the time which has elapsed since the elevation of the Bahamas above the sea in the Pleistocene epoch, we should have a means of determining the rate at which evolution and specific differentiation may proceed in such an assemblage of pulmonate mollusks placed in a suitable environment and not subjected to serious competition.

Pre-Cambrian Rocks of the Franklin Furnace Quadrangle: Mr. A. C. SPENCER.

The view held by Rodgers, Cooke and Britton that the gneisses of the New Jersey Highlands are mainly metamorphosed sediments, has not been seriously challenged up to the present time, though two of the more recent investigators of the field (Nason in 1890 and Wolff in 1896) have left the way open for accepting an igneous origin for these banded feldspathic rocks. Field work in the vicinity of Franklin Furnace carried on during the summer of 1904 warrants the conclusion that, so far as this particular field is concerned, the only sediments are the white limestone and a few patches of quartzite, the several types of gneiss being undoubtedly igneous and in large part demonstrably intrusive. For the purpose of the geologic map five divisions of the pre-Cambrian rocks will be recognized: (1) the Franklin white limestone; (2) a complex of diorites and granites showing more or less gneissic structure; (3) black hornblende or pyroxene gneiss; (4) white granite gneiss, and (5) coarse granite or pegmatite.

Age relations have been established as follows: The pegmatites cut all the other rocks; the white gneiss cuts (2) and (3); the black gneiss cuts (1) and both phases of (2); and finally the granite phase of (2) cuts the limestone (1). The relation of the diorite phase of (2) to the limestone has not been observed.

Consanguinity in the Eruptive Rocks of Cripple Creek: Mr. L. C. GRATON.

Mr. Graton showed that three magmatic

groups may be distinguished, of which the most important is the series of rocks from the Cripple Creek volcano. All the rocks of this group possess certain characteristics in common and are of particular interest in having a constant ratio of silica to alumina—a proof of their derivation from a single magma. By making certain assumptions based on the field observations, the relative volumes of these rocks were computed, and by that means an analysis was obtained which was considered to approximate the composition of the total product from the magma reservoir, *i. e.*, the average rock of the Cripple Creek volcano.

The Big Sink on the Lucin Route across Great Salt Lake: Mr. J. M. BOUTWELL.

Mr. Boutwell described the construction of the long trestle extending across Great Salt Lake, and presented observations which have an important bearing on the question of the character and depth of the intermontane rock basins beneath the Pleistocene sediments. The author will later communicate a more complete statement to SCIENCE.

GEO. OTIS SMITH,
Secretary.

THE SCIENCE CLUB OF NORTHWESTERN UNIVERSITY.

THE Science Club of Northwestern University held its regular monthly meeting in the physical lecture room of Science Hall, on Friday evening, February 3, 1905, at 7:30 P.M. Papers were presented by J. W. Goldwait on 'Post-glacial Land Movements in New England,' and by Professor U. S. Grant on 'Recent Contributions to Metamorphism.'

FLOYD FIELD,
Secretary.

DISCUSSION AND CORRESPONDENCE.

A NEMATODE DISEASE OF GRASSES.

IN Europe there have been known for many years certain diseases of grasses, including wheat, caused by nematodes, which penetrate, in the larval state, the ovaries of the flowers and there reach maturity and lay their eggs. The resulting larvæ reach a certain degree of development and then, with the drying up of

the host plant, coil up and dry out themselves. In this dried-out condition they may remain motionless but alive for years. On falling to the ground the affected seeds absorb moisture and the worms uncoil, bore their way out to freedom and, finding new grass plants, enter them and ascend to the flower, thus completing the circle of development.

The affected seeds are usually shorter, sometimes, however, much longer than the normal seeds and are incapable of germination. The glumes are much enlarged and the spikelets stand out at a different angle from, and are often more crowded on the axis. In fact, the affected plants may appear to be specifically distinct, and one case is known in America where a diseased plant was actually described as a new species, the presence of the nematodes having escaped the notice of the investigator.

Although known in Europe for a long time, practically no attention has been paid to this type of nematode disease in America. On behalf of the Bureau of Plant Industry of the U. S. Department of Agriculture, the writer has resumed his work, interrupted four years ago, on the nematode diseases of plants. He has found the disease in question in grasses from Texas, Oregon and Alaska, in the genera *Chætochloa*, *Agropyron*, *Elymus*, *Calamagrostis* and *Trisetum*. Two, possibly three, species of nematodes were found, all belonging to the genus *Tylenchus*. Cultural experiments are now under way to determine, if possible, whether any of them are identical with *T. tritici* of wheat in Europe. In the meantime, the writer would be very glad to receive all specimens of grasses and other plants suspected of harboring nematodes in their parts above ground as he wishes to determine what plants are affected and which species of nematodes cause the diseases.

ERNST A. BESSEY.

U. S. DEPARTMENT OF AGRICULTURE.

SPECIAL ARTICLES.

THE OLYMPIC PENINSULA OF WASHINGTON.

A VISIT of five weeks in western Washington in 1902 gave opportunity for the following notes on a region as yet almost unexplored. The Olympic Peninsula forms the extreme

northwest corner of the United States, and, as may be seen from any map, is almost cut off by water on every side. The climate is mild, temperatures ranging at sea level from 22° F. in winter to 86° F. in summer. The annual precipitation amounts to 120 inches at Neah Bay. Rain falls gently, and is to be expected for ten months of the year. In July and August there is usually no rain at all, so that the forest litter becomes very dry, and serious fires sometimes occur. Snow is only occasional at sea level, but at high elevations all of the precipitation is in the form of snow.

The peninsula is mostly occupied by the Olympic Mountains, an irregular group, radiating out from Mt. Olympus, 8,150 feet. Many other peaks rise from 7,000 to 8,000 feet, and large areas lie above 6,000 feet. As the whole tract is only sixty miles wide from east to west, and one hundred miles long, the hills and valleys are extremely rugged and precipitous. "Glaciers and snow-fields are numerous in the central parts of the mountains" (Dodwell and Rixon). Persons sometimes speak of the Olympics as volcanic, but we saw no sign of volcanism either in the rocks or in the pebbles of the Quinault or Queets rivers. Along the coast a soft, green, marly, Cretaceous sandstone lies in gentle folds, each crest jutting out to sea as a steep headland 150 to 500 feet high. Rivers occupy the synclines. In the sandstone many fossils are found. Especially noticeable were stumps, logs and fragments of wood at different levels and in various stages of transition to lignite. Capping this stratum is a layer of recent yellow gravel, varying from ten to forty feet in thickness, and also enclosing logs and stumps. Below Point Granville the beach is low and sandy, but north of this steep cliffs rise directly from high water line. At various points (Copalis, Klaylock Creek) government inspectors have found indications of petroleum, but no other valuable minerals are known.

The vegetation of the Olympic Peninsula is truly remarkable. Below 5,000 feet is the great northwestern forest, which must be seen to be appreciated. Douglas fir, tideland spruce and 'red cedar' (*Thuja plicata*) reach

gigantic proportions. The available timber per township runs from '3,000 feet B. M. amid the high mountains, up to 59,000 feet B. M. in the northwest corner' (Dodwell and Rixon). What with fallen timber and undergrowth of ferns and shrubs the forest is a veritable jungle. By hard work one can travel a quarter of a mile an hour off the trails!

Salal-berry (*Gaultheria shallon*) and species of *Rubus*, *Vaccinium* and *Ribes* contribute largely to the denseness of the jungle, and furnish abundant food for man and beast. The matted tree tops admit only a gloomy light below, and the darkness is deepened by great blankets of *Selaginella* (*S. oregana*) and bearded lichen (*Usnea*) depending from the branches. A thick bed of moss covers all the ground and swathes the bases of the tree trunks. Above 2,000 feet, however, the forest is quite open, but travel is impeded much more seriously by the impassably sharp hog-backs and steep canyon walls. The mountains slope more gently southward than on other sides, and it is believed that Mt. Olympus could be reached from the valley of the Quiniault River. The major part of the peninsula is held as the Olympic Forest Reserve. Two reports on this by Dodwell and Rixon (1, U. S. Geol. Surv., 21st Ann. Report, Part V., 1900; 2, ditto, Professional Paper No. 7, 1902) with maps and illustrations give the best accounts yet available concerning the region.

The fauna is equal to the flora in richness. Black bears, panthers, wild cats and wolves are numerous. A few squirrels and the mountain beaver are found. Deer and elk are plentiful. The garter snake is the only reptile. Wild duck and pheasants are occasional, and the familiar robin is seen about the houses. Salmon and trout of several kinds abound in all streams that are large enough. Quiniault salmon is said to be the finest on the coast. The report of the expedition from the Field Columbian Museum on the mammals of the Olympic Peninsula is the only record of its fauna.

In each river valley a distinct tribe of Indians originally made its home. The Makah

at Cape Flattery were studied by Swan, and are an extremely interesting group. The Quillayutes and Quiniaults would equally repay an immediate investigation; but their old habits are rapidly vanishing before the government schools. Whites began to settle the Quiniault Valley in 1892, but the movement is very slow on account of the difficulty of clearing land and of getting produce in and out. It is estimated to cost \$200 an acre to remove the timber enough for farming operations.

Here, then, is almost virgin soil for any kind of scientific investigation. Just enough has been done to enable the student to start intelligently and progress without interruption on any phase of this interesting region.

HENRY S. CONARD.

JOHNS HOPKINS UNIVERSITY,
February, 1905.

QUOTATIONS.

DR. OSLER ON THE PERIODS OF A TEACHER'S LIFE.*

I AM going to be very bold and touch on another question of some delicacy, but of infinite importance in university life, one that has not been settled in this country. I refer to a fixed period for the teacher, either of time of service or of age. Except in some proprietary schools, I do not know of any institutions in which there is a time limit of, say 20 years' service, as in some of the London hospitals, or in which a man is engaged for a term of years. Usually the appointment is *aut vitam aut culpam*, as the old phrase reads. It is a very serious matter in our young universities to have all of the professors growing old at the same time. In some places only an epidemic, a time limit, or an age limit, can save the situation.

I have two fixed ideas well known to my friends, harmless obsessions with which I sometimes bore them, but which have a direct bearing on this important problem. The first is the comparative uselessness of men above

* From his valedictory address at the Johns Hopkins University, given at the annual commemoration exercises on February 22, and printed in the *Journal of the American Medical Association*.

40 years of age. This may seem shocking, and yet read aright the world's history bears out the statement. Take the sum of human achievement in action, in science, in art, in literature—subtract the work of the men above 40, and, while we should miss great treasures, even priceless treasures, we should practically be where we are to-day. It is difficult to name a great and far-reaching conquest of the mind which has not been given to the world by a man on whose back the sun was still shining. The effective, moving, vitalizing work of the world is done between the ages of 25 and 40 years—these 15 golden years of plenty, the anabolic or constructive period, in which there is always a balance in the mental bank and the credit is still good.

In the science and art of medicine there has not been an advance of the first rank which has not been initiated by young or comparatively young men. Vesalius, Harvey, Hunter, Bichat, Laennec, Virchow, Lister, Koch—the green years were yet on their heads when their epoch-making studies were made. To modify an old saying, a man is sane morally at 30, rich mentally at 40, wise spiritually at 50—or never. The young men should be encouraged and afforded every possible chance to show what is in them. If there is one thing more than another upon which the professors of the university are to be congratulated, it is this very sympathy and fellowship with their junior associates, upon whom really in many departments, in mine certainly, has fallen the brunt of the work. And herein lies the chief value of the teacher who has passed his climacteric and is no longer a productive factor; he can play the man midwife, as Socrates did to Thesetetus, and determine whether the thoughts which the young men are bringing to the light are false idols or true and noble births.

My second fixed idea is the uselessness of men above 60 years of age, and the incalculable benefit it would be in commercial, political and in professional life if, as a matter of course, men stopped work at this age. Donne tells us in his 'Biathanatos' that by the laws of certain wise states sexagenarii were precipitated from a bridge, and in Rome

men of that age were not admitted to the suffrage, and were called *de pontani* because the way to the senate was *per pontem* and they from age were not permitted to come hither. In that charming novel, the 'Fixed Period,' Anthony Trollope discusses the practical advantages in modern life of a return to this ancient usage, and the plot hinges on the admirable scheme of a college into which at 60 men retired for a year of contemplation before a peaceful departure by chloroform. That incalculable benefits might follow such a scheme is apparent to any one who, like myself, is nearing the limit, and who has made a careful study of the calamities which may befall men during the seventh and eighth decades!

Still more when he contemplates the many evils which they perpetuate unconsciously and with impunity! As it can be maintained that all the great advances have come from men under 40, so the history of the world shows that a very large proportion of the evils may be traced to the sexagenarians—nearly all the great mistakes politically and socially, all of the worst poems, most of the bad pictures, a majority of the bad novels, and not a few of the bad sermons and speeches. It is not to be denied that occasionally there is a sexagenarian whose mind, as Cicero remarks, stands out of reach of the body's decay. Such a one has learned the secret of Hermippus, that ancient Roman, who, feeling that the silver cord was loosening, cut himself clear from all companions of his own age, and betook himself to the company of young men, mingling with their games and studies, and so lived to the age of 153, *puerorum habitu refocillatus et educatus*. And there is truth in the story, since it is only those who live with the young who maintain a fresh outlook on the new problems of the world.

The teacher's life should have three periods—study until 25, investigation until 40, profession until 60, at which age I would have him retired on a double allowance. Whether Anthony Trollope's suggestion of a college and chloroform should be carried out or not, I have become a little dubious, as my own time is getting so short.

*REPORT OF THE COAST AND GEODETIC
SURVEY FOR 1904.*

THE report of the Coast and Geodetic Survey for 1904 is a record of manifold labors and results which have for their theater of action an area practically coterminous with that of the United States and all its island possessions. The main body of the report contains a detailed account of the wide range of important duties devolving upon this bureau, and in the appendices we have a presentation of discussions and results which must prove of great economical value and interest to surveyors, engineers, navigators and physicists.

The resurveys and developments imperatively required to show the changes in harbors and approaches, due to works of improvement or the ceaseless action of natural causes along the Atlantic, Pacific and Gulf coasts of the United States, and to meet the ever-increasing demands of our commerce and navy for up-to-date charts, particularly of the waters of Alaska, Porto Rico, Hawaii and the Philippines, gave constant employment to the eleven vessels available for these duties. The hydrography was prosecuted within the limits of the waters of sixteen states and territories and the topography was carried on in nine.

In Alaska the work included the continuation of the survey of Prince William Sound, the survey of Controller Bay and a deep-sea examination from the Strait of Juan de Fuca to Prince William Sound, preliminary to the laying of a deep-sea cable from Seattle to Valdez. The Porto Rico work was continued in certain bays and harbors as well as in the development of the conditions in the off-shore waters. In the Philippine Archipelago the survey has secured the cooperation of the insular government and a detailed résumé shows a most satisfactory progress of the triangulation, hydrographic, topographic, magnetic and astronomical operations. By utilizing native assistance in the Manila sub-office twenty-one charts were prepared for publication during the year, and the outcome of the experience with Filipinos as draftsmen, computers and engravers is the gratifying demonstration that they will prove equally as competent as the Hindoos have been found in the

British Indian operations and the Malagassys have proved themselves in the French surveying work in Madagascar.

The reconnaissance for the primary triangulation along the 98th meridian was completed to the Canadian border and a scheme was extended eastward connecting this work with the triangulation of the Mississippi River Commission. The execution of the primary triangulation in the Dakotas and Texas was prosecuted at a rate which surpassed even the notable record which had already secured an enviable reputation for the geodetic operations along the 98th meridian, the total extension amounting to 300 miles (500 kilometers). An equal distinction must be accredited to similar work in California and Oregon whereon remarkable progress has been made in connecting the transcontinental arc work with Puget Sound.

The progress of the magnetic work is shown in detail in Appendix No. 3, which includes a table of results of the magnetic declinations, dip and intensity of force observed on land and sea during the year, this being supplemented with full descriptions of the magnetic stations occupied and meridian lines observed. A new feature is the inclusion of the observations of the three magnetic elements at sea by the Coast and Geodetic Survey vessels in the course of their regular surveying operations. The paper is replete with matters of interest to the surveyor, the mariner, the geographer and the geologist. Thus comprehensive examination has been made of certain locally disturbed areas, as for example, in Douglas Island, Alaska, in the region of the local magnetic pole found in 1900; and the completion of the magnetic survey of Louisiana in cooperation with the state geological survey revealed interesting and important results as regards both the magnetic distribution and the secular variation.

The table contains the magnetic results at 384 land stations distributed over 24 states and territories and 2 foreign countries. The table of sea results contains 52 entries of magnetic declination, 34 dips and 32 values of the total intensity of the magnetic force in the Atlantic and in the Pacific Oceans. The

methods and instruments adopted for the sea work, which have thus far proved successful, are described in detail. In a general retrospective consideration of the work of the past five years it is pointed out that in this period observations have been made at 1,636 stations of which about one eighth are points previously occupied by the survey and since used for observations to secure data for ascertaining the secular change of the magnetic elements. The work in about a dozen states has been practically completed except for special investigations and secular change observations. During the year a bureau of international research in terrestrial magnetism has been created by the Carnegie Institution of Washington, with the inspector of the magnetic work of the coast survey in charge as director, and the cooperation thus ensured is certain to prove extremely profitable in results.

The determination of the longitude of Manila from San Francisco, thus completing the first longitude circuit of the earth, was one of the astronomical events of the year, and in Appendix No. 4 is a comprehensive illustrated report on the various instruments and operations used in the undertaking with a comparative résumé of the various links and results from which the longitude of Manila had been determined from the westward. The generous cooperation of the Commercial Cable Company, through whose patriotic enterprise the work was made feasible, is gratefully acknowledged. The results of the determinations from the eastward and westward differ only by 0^s.006 or about 8.8 feet. The other results of this expedition are the determinations by the telegraphic method of the longitudes of Honolulu, and Midway and Guam Islands.

The third attempt at representing the tide for the world at large, the first having been made by Whewell and Airy and the second by Berghaus, is described in Appendix No. 5. The advancement in recent years of the general use of the harmonic analysis and the greatly improved tidal data that are now obtainable for such a great part of the globe coordinate to make a new presentation of this subject very opportune. The theoretical dis-

cussion of the problems involved, the wide range of data and authorities consulted and referred to, the graphic presentation of the cotidal lines, the results presented and the conclusions deduced make a most suggestive paper and one which will be highly interesting to all students of the subject.

The results of the precise leveling operations for the year are published in Appendices Nos. 6 and 7, which submit them in a detail that makes them immediately available for the requirements of surveyors and engineers. These extend the precise level net, as previously published, six hundred miles to the westward, from Red Desert, Wyoming, to Owyhee in eastern Idaho; and from Holland, Texas, two hundred miles southwest, to Seguin, Texas. An interesting feature is an account of the change in the manner of support for the leveling rods, with the comparative discussion of the old and the new methods and the consequent confirmation of the importance of the new system.

The account of operations submitted by the assistant in charge gives the story of the work of the various computing, drawing, engraving and chart divisions of the office, in which the results of the field work are discussed or prepared for the publications and charts wherein they are placed at the service of the public.

A full account of the first recording transit micrometer devised for use in the telegraphic longitude determinations of the Coast and Geodetic Survey is submitted in Appendix No. 8, with an account of the exhaustive tests it was subjected to and a recapitulation of the results of experience with this form of instrument, mainly in Europe, during the last thirteen years. The results of these experiments indicate that with the transit micrometer the accuracy of telegraphic longitudes may be considerably increased, if desirable, or the present standard of accuracy may be maintained at much less cost than formerly.

The results of all triangulation in California south of the latitude of Monterey Bay are printed in the concluding appendix in full, including descriptions of stations, as well as their latitudes and longitudes and the lengths and azimuths of the lines joining them. In

compact and convenient form there is given all the information in regard to this triangulation that is needed by an engineer or surveyor who wishes to utilize the results in controlling and checking surveys or in constructing maps or charts. The locations of more than 1,300 points are accurately fixed by this triangulation.

The report, in addition to the details of the foregoing operations and results, contains a record of a wide range of important work for which the aid of a survey was sought because of the special training of its officers. The superintendent attended the Fourteenth General Conference of the International Geodetic Association as delegate for the United States and maintained direction of the observatories at Gaithersburg, Maryland, and Ukiah, California, supported by the International Geodetic Association for the purpose of measuring the variations of latitude; he was also detailed for duty in connection with the presentation of the case of the United States before the Alaska Boundary Tribunal being assisted by one of the officers of the survey. As commissioner of the United States he continued the work of remarking the boundary line between the United States and Canada from the Rocky Mountains westward, two of the officers of the survey being employed in the field; and as commissioner of the United States in the International Delimitation Commission he inaugurated the work of marking the boundary between Alaska and Canada, one of the parties being under the direction of an assistant of the survey. One officer continued on duty as a member of the Mississippi River Commission. One officer having completed the field work of the survey of Mason and Dixon's line, the boundary between Maryland and Pennsylvania, was then detailed to prepare the maps and report showing the results of the work. Another officer, at the application of the municipal authorities, remained in charge of the triangulation of the Greater New York territory, and one representative of the survey in cooperation with the Louisiana Oyster Commission continued the survey of the natural oyster beds and reefs for the state of Louisiana.

THE PRESERVATION OF AMERICAN ANTIQUITIES.

At a joint meeting of the committees on preservation of American antiquities of the Archeological Institute of America and the American Anthropological Association, held at the Cosmos Club in Washington, on the evening of January 10, the subject of pending legislation was considered. It was decided that a memorandum should be prepared embodying such provisions from pending measures, as in the judgment of the joint committee should be incorporated into law, and the same presented to the House of Representatives' Committee on Public Lands, with the request that a bill should be prepared by this committee based on these suggestions.

Present: For the Archeological Institute of America, Dr. Seymour, Chairman, Dr. Putnam, Mr. Holmes, Mr. Bowditch, Dr. Kelsey, Dr. Carroll; for the Anthropological Association, Mr. Holmes, Chairman, Dr. Putnam, Miss Fletcher, Professor Saville, Dr. Gordon, Mr. Culin, Dr. Kroeber, Mr. Hewett.

The memorandum was submitted by the committee at the hearing before the Public Lands Committee on Wednesday, the eleventh.

At the meeting of this committee held on the sixteenth instant it was ordered to strike out all except the enacting clause of S. 5603 (the act known as the Lodge-Rodenburg bill which passed the senate last April) and insert instead "an amendment in the form of a substitute"; said substitute being, with a few minor amendments, the memorandum prepared by the joint committee above referred to. The bill as reported back, referred to the House Calendar, and ordered printed, is as follows:

Sec. 1. Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled: That for the purpose of preserving and protecting from despoliation the historic and prehistoric ruins, monuments, archeological objects and other antiquities, on the public lands of the United States, all said historic and prehistoric ruins, monuments and other objects of antiquity are hereby placed under the care and custody of the Secretary of the Interior.

Sec. 2. That the Secretary of the Interior may make temporary withdrawals of the land on

which such historic and prehistoric ruins, monuments, archeological objects and other antiquities are located, including only the land necessary for the preservation of such ruins and antiquities, and may make permanent withdrawals of tracts of land on which are ruins and antiquities of especial importance, not exceeding six hundred and forty acres in any one place.

Sec. 3. That the Secretary of the Interior be, and is hereby authorized to permit examinations, excavations and the gathering of objects of interest within such reservations by any institution either domestic or foreign which he may deem properly qualified to conduct such examinations, excavations or gatherings, subject to such rules and regulations as he may prescribe: *Provided*, That the examinations, excavations and gatherings are undertaken for the benefit of some reputable museum, university, college or other recognized scientific or educational institution with a view to increasing the knowledge of such objects, and that the gatherings shall be made for permanent preservation and not for commercial purposes.

Sec. 4. That of all excavations and explorations made under a permit granted by the Secretary of the Interior, a proper written and photographic record with plans shall be made at stated periods, and transmitted for preservation to the United States National Museum.

Sec. 5. That the Secretary of the Interior shall make and publish from time to time such rules and regulations as he shall deem expedient and necessary for the purpose of carrying out the provisions of this act.

Sec. 6. That all persons who shall without permission appropriate, injure or destroy any public property therein, or injure or destroy any caves, ruins, or other works or objects of antiquity therein, or commit unauthorized injury or waste, in any form whatsoever, upon the lands or objects referred to in this act, or who shall violate any of the rules or regulations prescribed hereunder, shall, upon conviction, be fined in a sum not more than five thousand dollars, or be imprisoned for a period not more than twelve months, or shall suffer both fine and imprisonment, in the discretion of the court.

EDGAR L. HEWETT,
Secretary.

SCIENTIFIC NOTES AND NEWS.

At the recent commemoration ceremonies at the University of Pennsylvania, the degree of Doctor of Science was conferred on Dr. R. S. Woodward, president of the Carnegie Insti-

tution. The colleagues of Dr. Woodward at Columbia University will join in giving a dinner in his honor on the evening of April 4.

DR. WILLIAM OSLER gave a farewell address at the commemoration exercises at Johns Hopkins University on February 22. The degree of Doctor of Laws was conferred on him by the university.

DR. HANS LANDOLT, professor of chemistry at Berlin, has been awarded the gold medal for science of the Berlin Academy of Sciences.

DR. PAUL EHRLICH, director of the Institute for Experimental Therapeutics at Frankfort, has been appointed honorary professor in the University of Göttingen.

DR. CARL MOEBIUS, professor of zoology at Berlin, celebrated his eightieth birthday on February 7.

DR. HEINRICH LIMPRICHT, professor of chemistry at Greifswald, has celebrated his jubilee as university professor.

PROFESSOR HARRY C. JONES, of the Johns Hopkins University, has been awarded \$1,000 by the Carnegie Institution, with which to continue his work, on the nature of concentrated solutions, during the year 1905-1906. This is a renewal of the grant that he now holds for the same amount and for the same investigation. Dr. H. P. Bassett, who received his Ph.D. under Professor Jones in June, 1904, has been reappointed as his assistant.

THE Committee on Science and the Arts, of the Franklin Institute, Philadelphia, has recommended to the Board of City Trusts that Dr. Persifor Frazer be awarded the John Scott legacy premium and medal for his 'system of quantitative colorimetry,' for determining the genuineness of exhibits of handwriting.

MR. HENRY M. TOWNE, president of the Yale and Towne Manufacturing Company, Stamford, Connecticut, and past-president of the American Society of Mechanical Engineers, gave on February 24, an address before the faculty and students of Purdue University. His subject was 'Industrial Engineering.' The university has also announced lectures at an early date by Mr. William Barclay Parsons and Mr. Frederic A. C. Perrine.

To perpetuate the memory of C. L. Herrick in the scientific world and among the friends of Denison University, and as a tribute of gratitude for his services, the Denison Scientific Association has appointed a committee to secure a fund to be known as 'The C. L. Herrick Memorial Fund.' The first purpose of the committee is to secure for Denison University Dr. Herrick's scientific library, which his family is obliged to dispose of. It is hoped, however, that only a portion of the fund will be used in procuring the library and that an adequate principal may be set aside, the income of which will be available in maintaining the serials represented in the library and in otherwise fostering the interests of science. A friend of the institution has promised to duplicate all subscriptions made for this purpose before July first next. Subscriptions may be sent to Professor Frank Carney, Denison, Ohio.

WE regret to record the death of M. S. J. P. Folie, honorary director of the Observatory of Brussels, on January 29, at the age of seventy-one years; of Dr. Eduard Richter, professor of geography at Graz; and of Professor T. Bertelli, the Italian astronomer.

THE U. S. Civil Service Commission announces an examination on March 29 to secure eligibles from which to fill a vacancy in the position of cement expert at \$2,400, and another at \$1,500 per annum, in the Reclamation Service, Geological Survey, and vacancies as they may occur in any branch of the service requiring similar qualifications. It is expected that in the near future there will be additional vacancies at salaries between \$1,500 and \$2,400 per annum.

THE sixteenth session of the Biological Laboratory of the Brooklyn Institute of Arts and Sciences will be held at Cold Spring Harbor, Long Island, beginning July 5, 1905, lasting for six weeks. The usual courses of field zoology by Drs. Davenport and Breed, comparative anatomy by Drs. Pratt and Casteel, embryology by Drs. Crampton and Moenkhaus, cryptogamic botany by Dr. Johnson and Mr. Chivers, plant ecology by Mr. Shreve and Miss Knox and microscopic methods by Mrs. Davenport are offered.

Those receiving instruction pay a fee of \$30, but independent investigators may be received at the laboratory at any time upon application to the director, Dr. C. B. Davenport, Cold Spring Harbor, N. Y., from whom the announcement just issued may be obtained.

THE legislature of North Dakota has passed a comprehensive irrigation code which follows closely the provisions of the suggested state irrigation code drawn up last summer by Mr. Morris Bien of the U. S. Reclamation Service. This is the first effective legislation on the subject in North Dakota, and will put irrigation investigation upon a well established and permanent basis, so that it is now possible to secure the exclusive services of a competent man as a state engineer. The first state engineer, Professor E. F. Chandler, who began that work last season and has been carrying it on in addition to his work as resident hydrographer for the U. S. Geological Survey and to his regular duties in the state university, now transfers the office to Mr. A. L. Fellows, of Denver, Colo., who has been for the past two years district engineer for Colorado of the U. S. Reclamation Service, and who now under the new law is appointed by Governor Sarles state engineer of North Dakota.

THE trustees of the University of North Carolina have set aside the Shepard bequest of \$5,000 as an endowment fund for the library of the chemical department of the university.

A RECEPTION was held in the Germanic Museum of Harvard University on February 28, at which Dr. Theodore Lewald, German imperial commissioner at St. Louis, presented to the university the collection of maps, charts and models on behalf of the German emperor for the sociological museum in Emerson Hall. Professor Münsterberg received the gift on behalf of the university.

IN connection with the International Exposition to be held at Liège, Belgium, from April to November during the present year, it is proposed to hold an International Congress of Childhood from September 17 to 20

inclusive. The purpose of the congress is to consider the best means of promoting the physical, intellectual and moral development of youth in the home, the school and society. The congress will be organized in four sections, as follows: (1) Education of children; (2) study of children; (3) care and training of abnormal children; (4) parents' associations, mothers' clubs, and other supplementary agencies for the improvement of youth.

SENATOR ARMSTRONG has introduced a bill in the New York legislature which provides for the establishment of a biological survey of the potable water of the state to prosecute a scientific study of aquatic organisms, their structure, their habits, food, distribution and variations. It is planned to consider such sanitary problems of a biological character as may arise in regard to the waters used by and available for the cities, villages and towns of the state. The sum of \$5,000 is appropriated for the educational department of the state for apparatus and equipment and the sum of \$10,000 for salaries of employees. If the bill becomes a law the work will be under the direction of Professor Clarke.

THE complete collection of monographs possessed by the late Professor Gerhardt has been purchased and presented to the library of the Academy of Medicine by Dr. A. Jacobi.

THE *Times* states that Sir H. A. Blake, governor of Ceylon, announced at a meeting of the Asiatic Society that Sinhalese medical books of the sixth century described 67 varieties of mosquitoes and 424 kinds of malarial fever caused by mosquitoes.

UNIVERSITY AND EDUCATIONAL NEWS.

THE sad death of Mrs. Jane Lathrop Stanford will not greatly affect the administration or resources of the Leland Stanford Junior University. It will be remembered that for a long time her estate was tied up by litigation, but that in 1901 Mrs. Stanford made over to the trustees of the university practically all her property, including stocks conservatively appraised at \$18,000,000 and real estate valued at least at \$10,000,000.

It is announced that a new recitation building for Princeton University, to be known as

McCosh Hall, will soon be erected behind the university chapel, at a cost of \$100,000. The names of the givers are withheld.

HARVARD UNIVERSITY has received an anonymous gift of \$5,000, the income of which is to be used for the assistance of meritorious students in the Medical School.

By the will of the widow of the late George P. A. Healy, the medical library collected by the late artist is bequeathed to Rush Medical College.

THE University of Berlin has established an academic information bureau for the use of students, both native and foreign. It is prepared also to supply information on scientific subjects to visitors to Berlin.

PROFESSOR WILLIAM JAMES, of Harvard University, has accepted the acting professorship of philosophy at Stanford University. He will lecture at Stanford during the second half of the next academic year and will organize a department of philosophy for the university.

ON account of illness, Professor C. R. Sanger, of Harvard University, is spending a few weeks in Cuba. During his absence, Professor Sanger's direction of the chemical laboratory is assumed by Professor T. W. Richards, in addition to the latter's regular duties as chairman of the chemical department. Dr. G. P. Baxter has temporarily taken full charge of chemistry 1, and has therefore been relieved of his course in gas analysis by Dr. R. C. Wells.

M. HENRI BERGSON has been appointed professor of modern philosophy in the Collège de France, in the room of the late Gabriel Tarde.

DR. OTTO LUMMER, of the Reichsanstalt and docent at Berlin, has been appointed professor of physics at Breslau.

DR. K. KAISERLING, docent and custodian of the pathological museum at Berlin since 1901, has been made professor.

DR. LUDWIG CLAISON, professor of chemistry at Kiel, has been called to Berlin.

DR. FRANZ HOFMANN, associate professor of physiology at Leipzig, has been called to a professorship at Innsbruck.